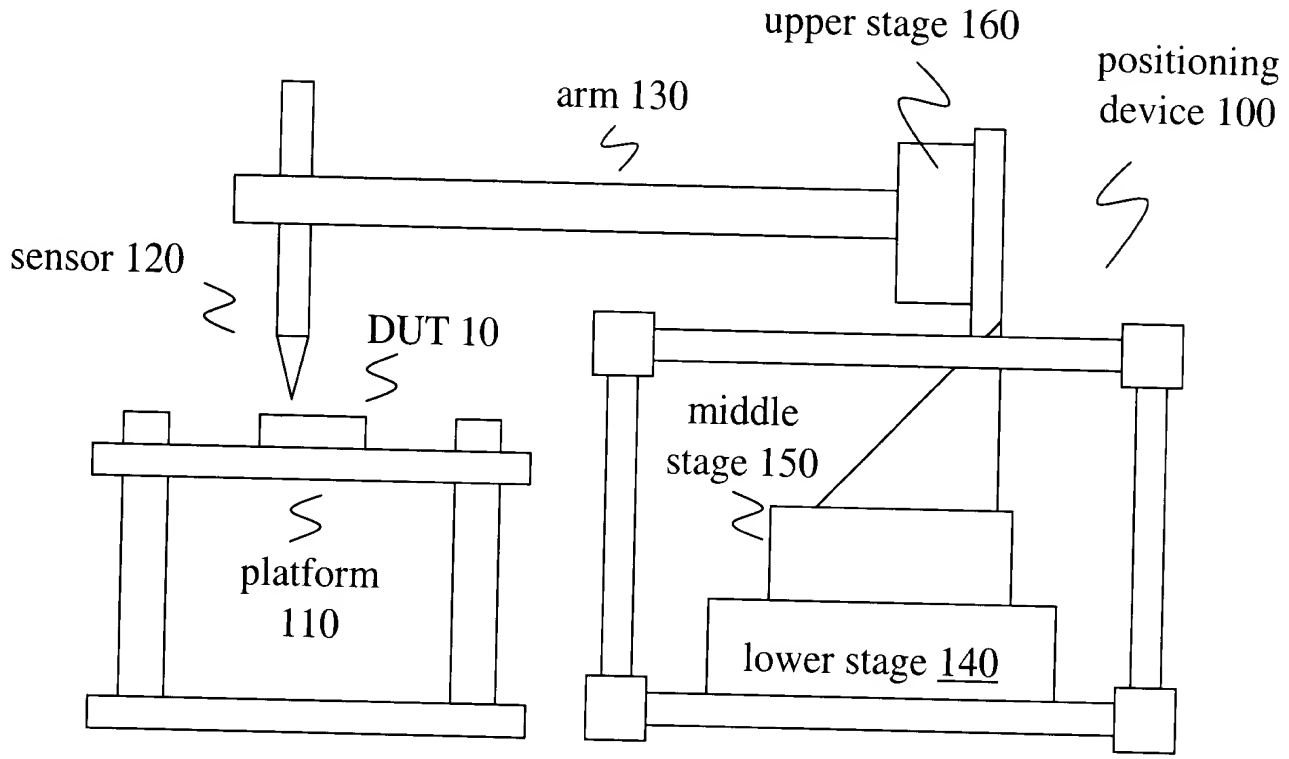


FIG. 1

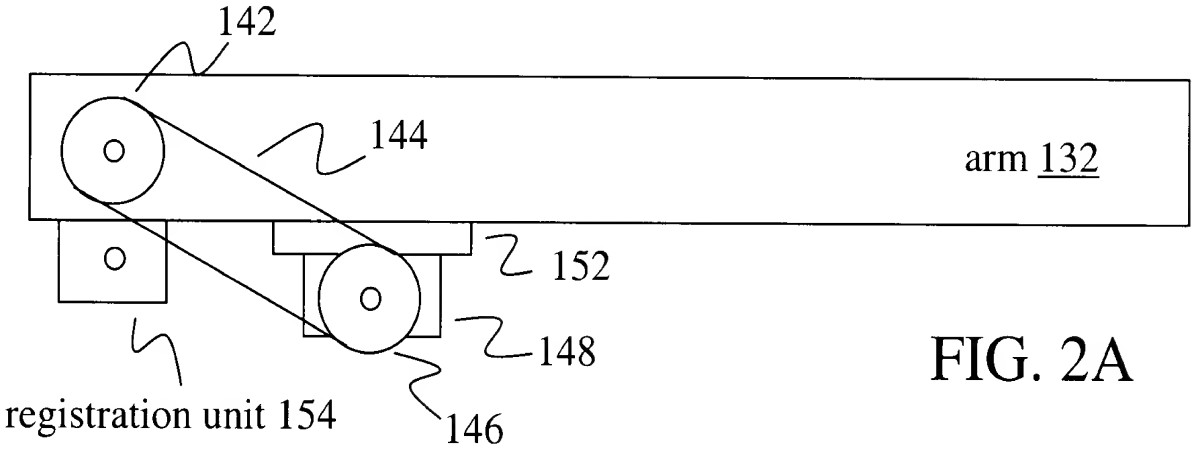


FIG. 2A

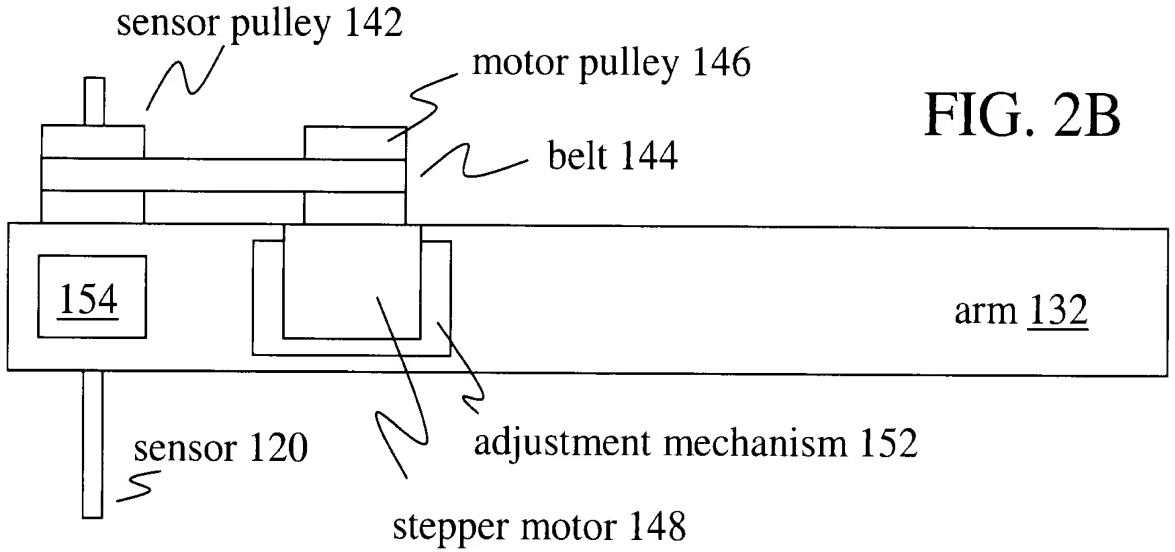


FIG. 2B

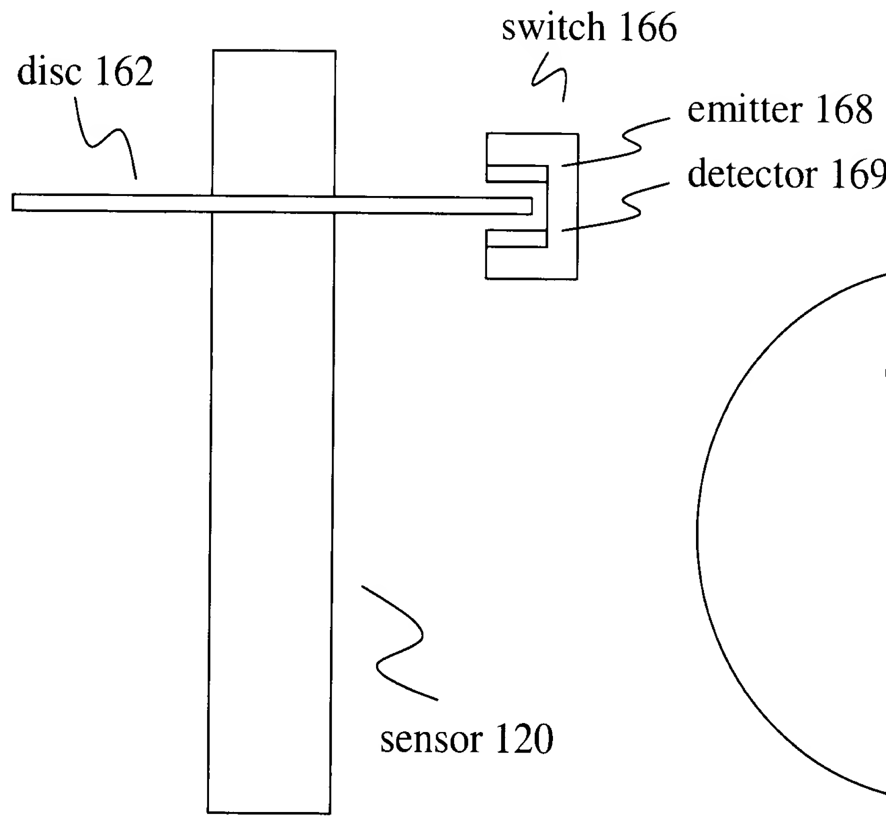


FIG. 3A

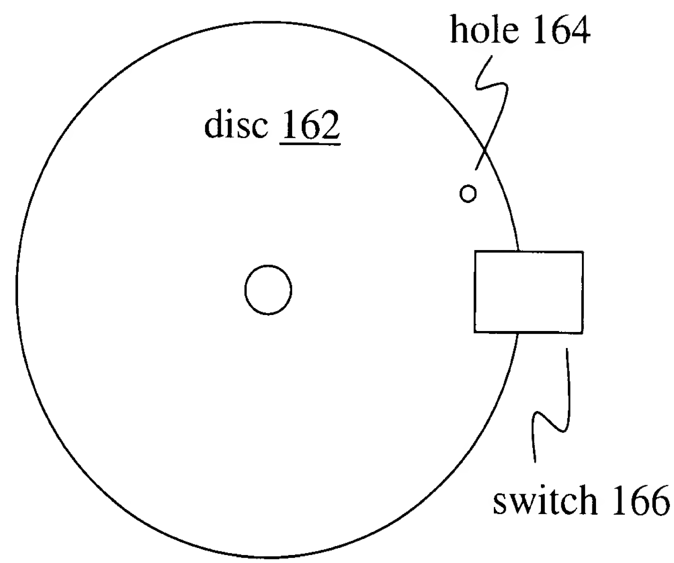


FIG. 3B

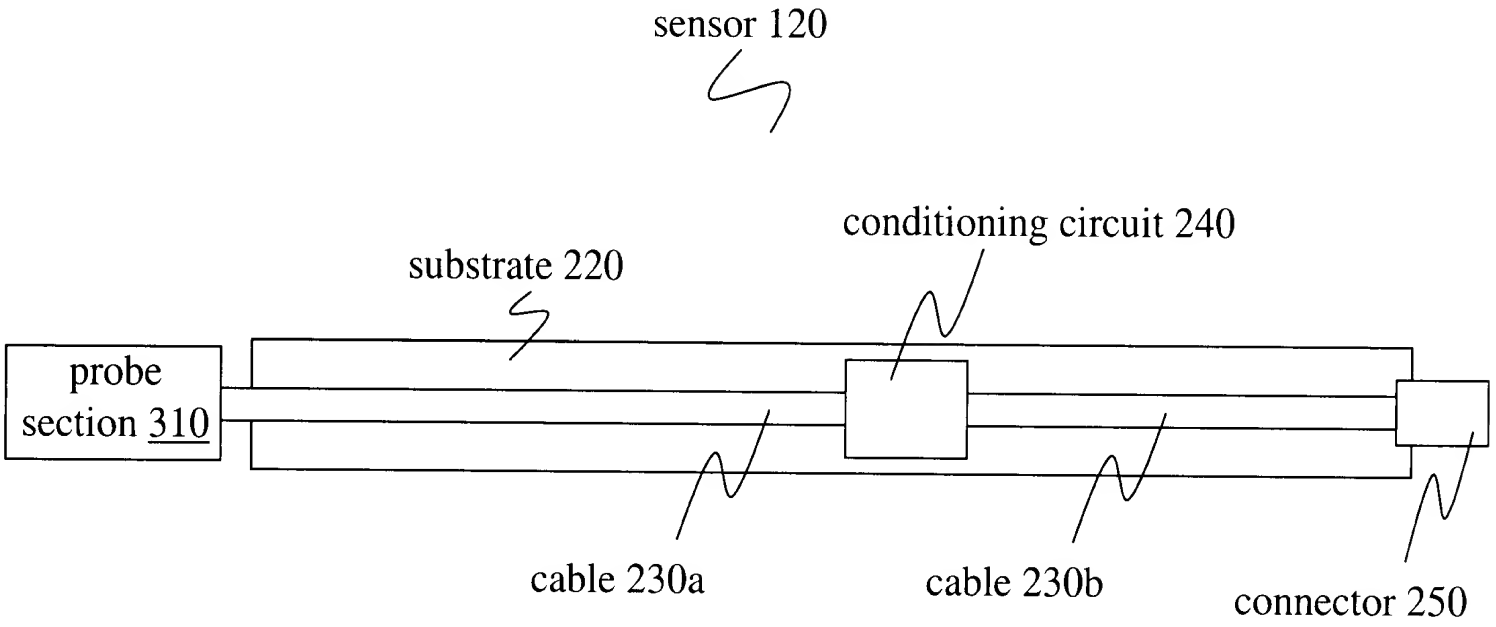


FIG. 4

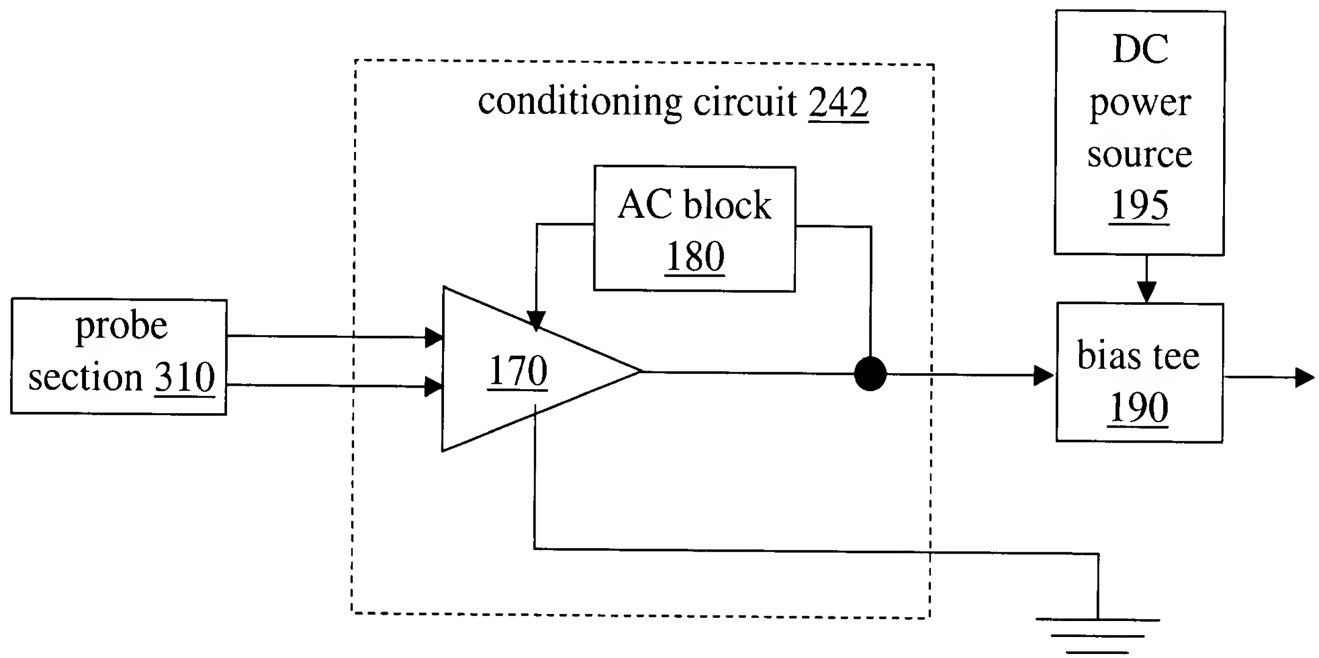

conditioning circuit 242
AC block
180
DC
power
source
195
probe
section 310
170
bias tee
190

FIG. 5

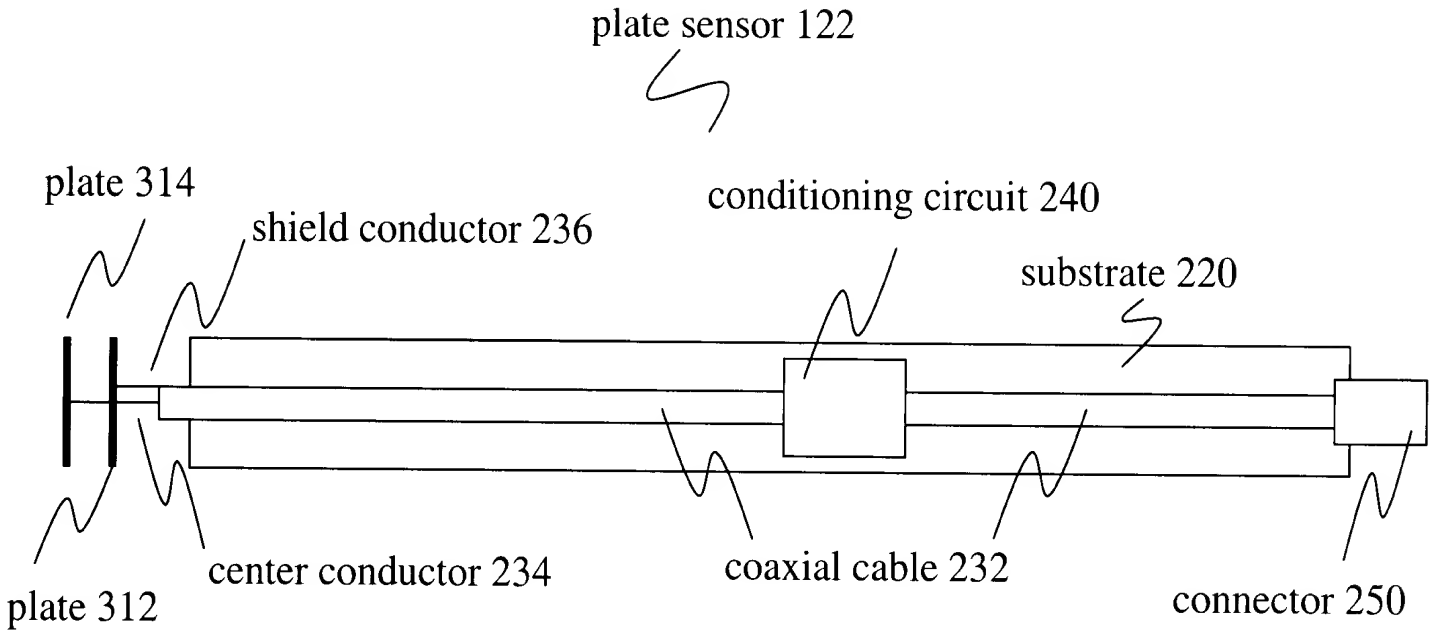
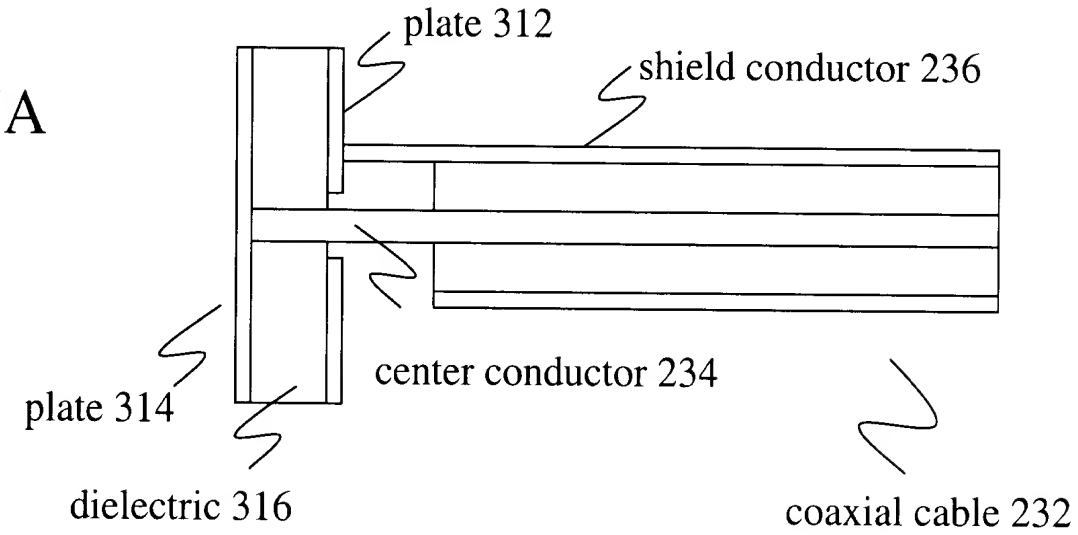


FIG. 6

FIG. 7A



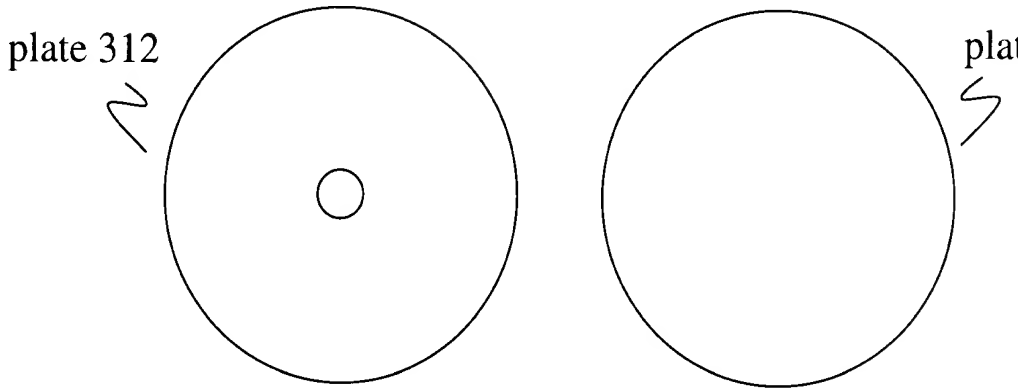


FIG. 7B

FIG. 8

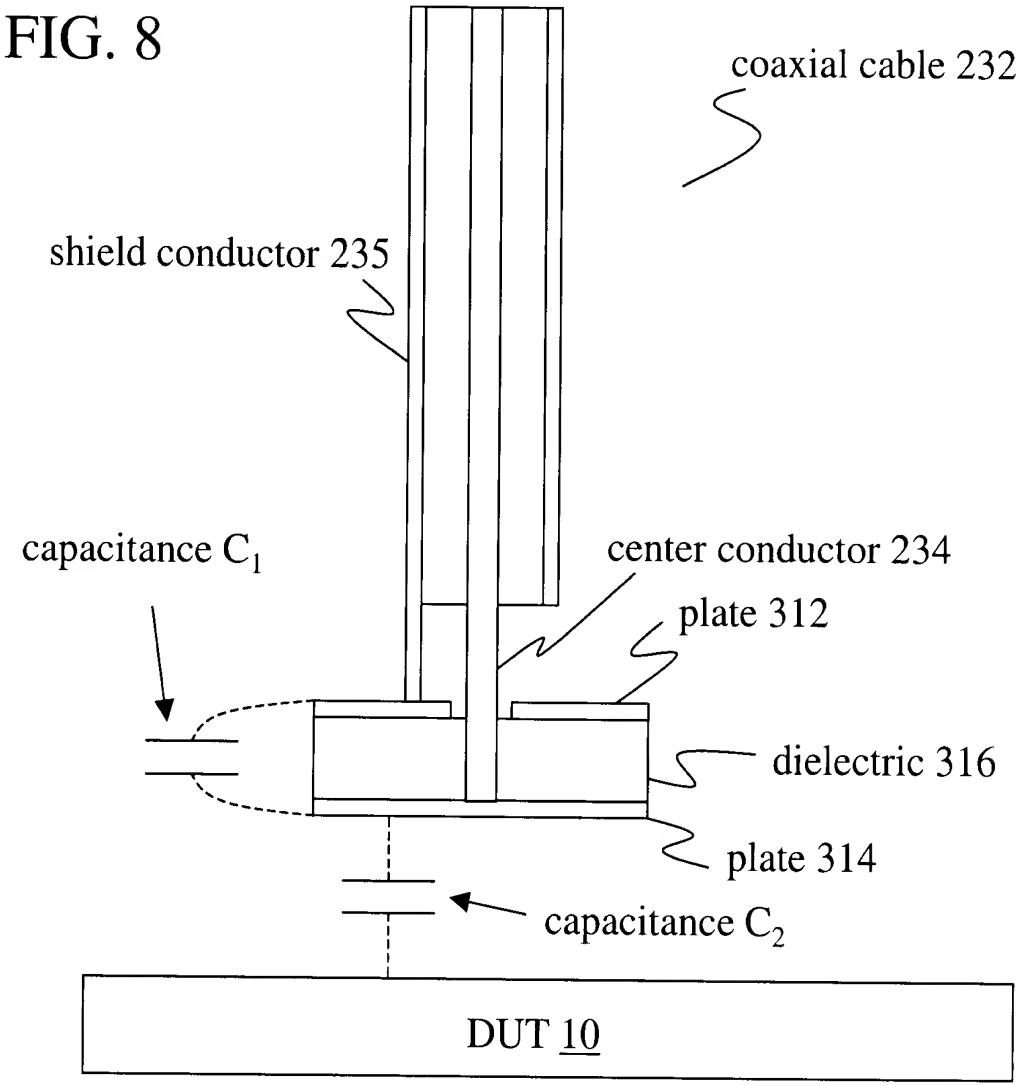


FIG. 9A

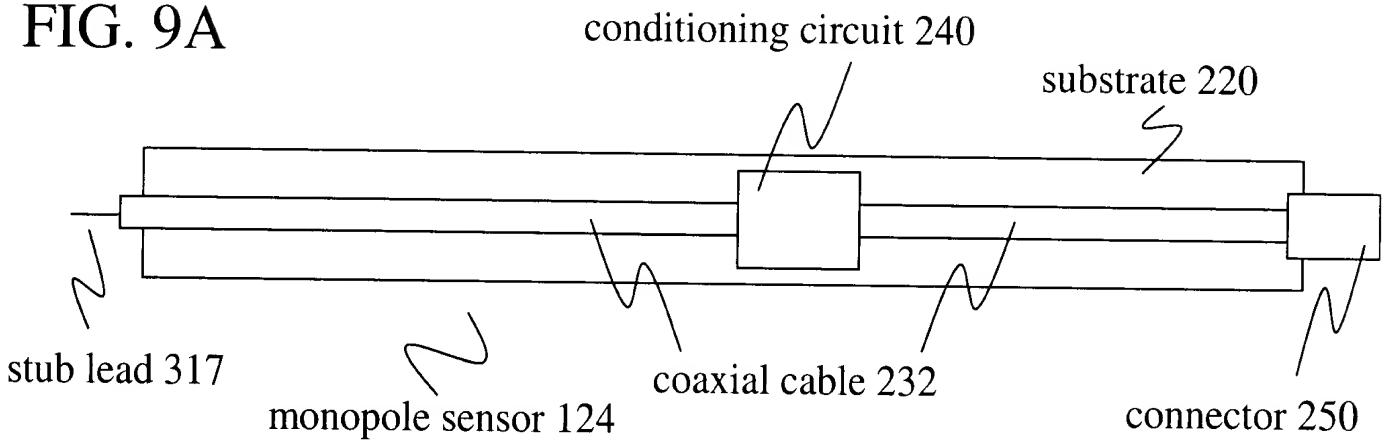
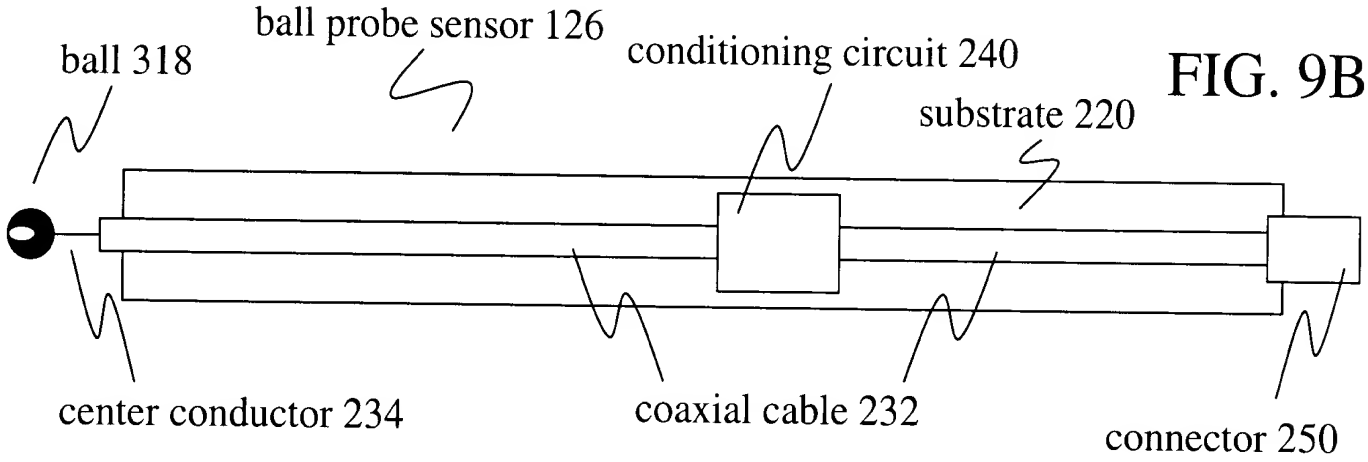


FIG. 9B



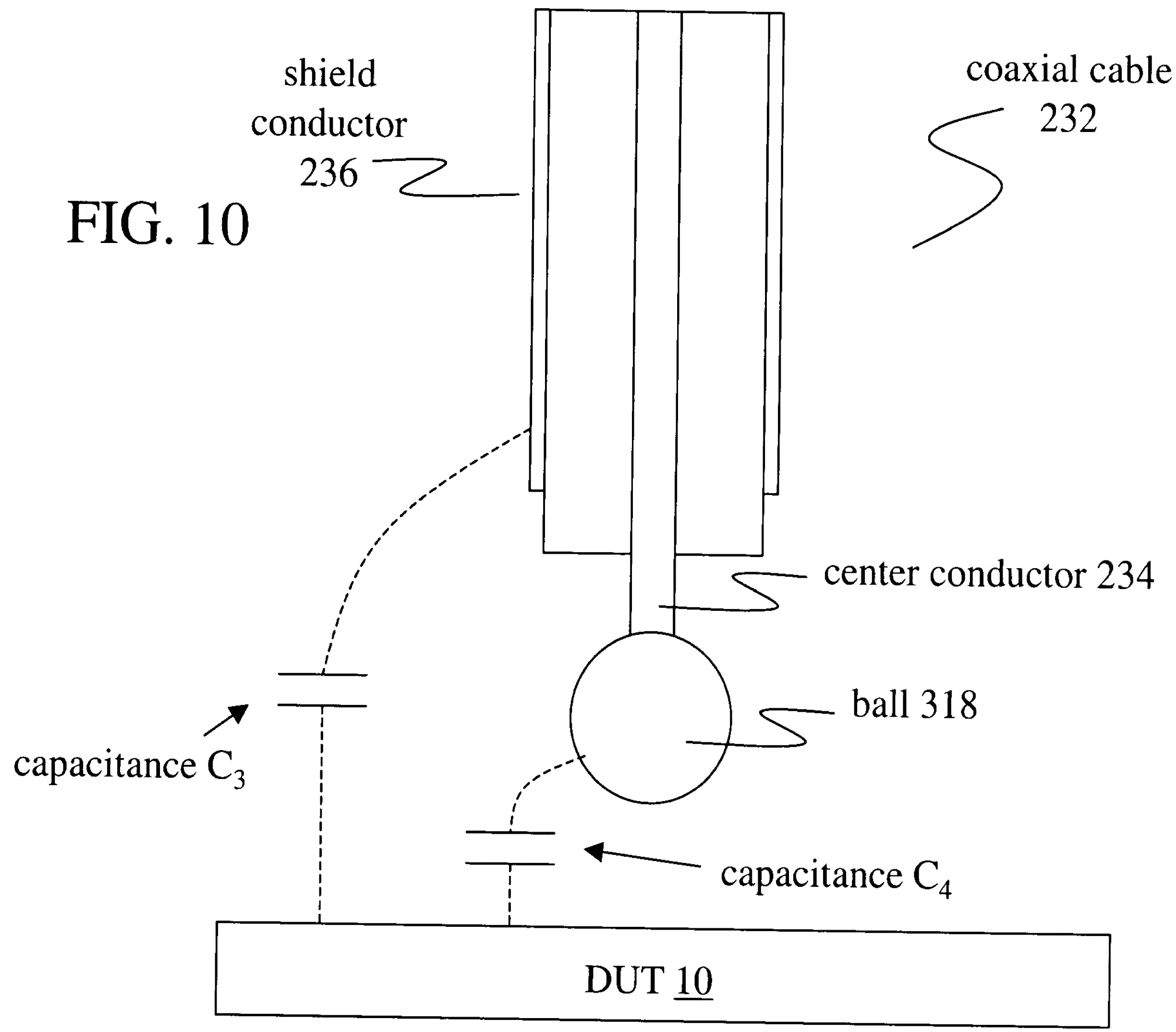

shield
conductor
236
coaxial cable
232
center conductor 234
ball 318
capacitance C_3
capacitance C_4
DUT 10

FIG. 10

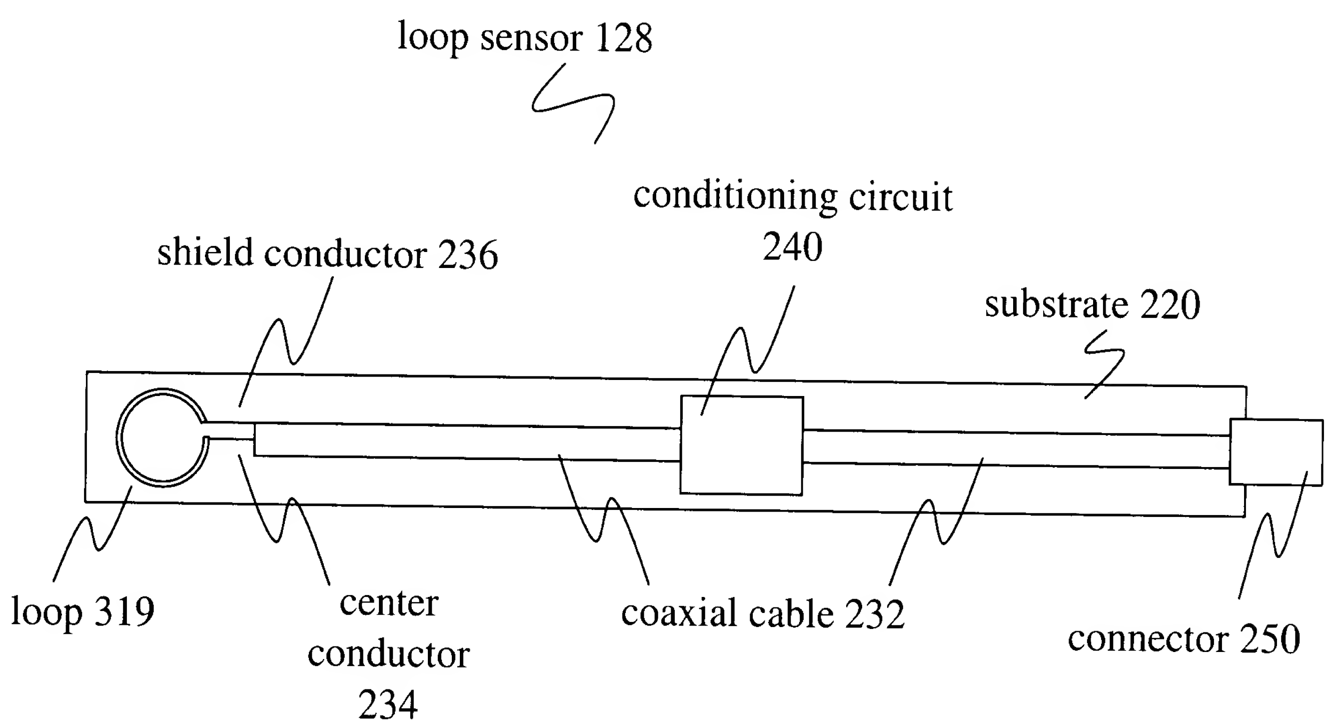

loop sensor 128
shield conductor 236
conditioning circuit
240
substrate 220
loop 319
center
conductor
234
coaxial cable 232
connector 250

FIG. 11

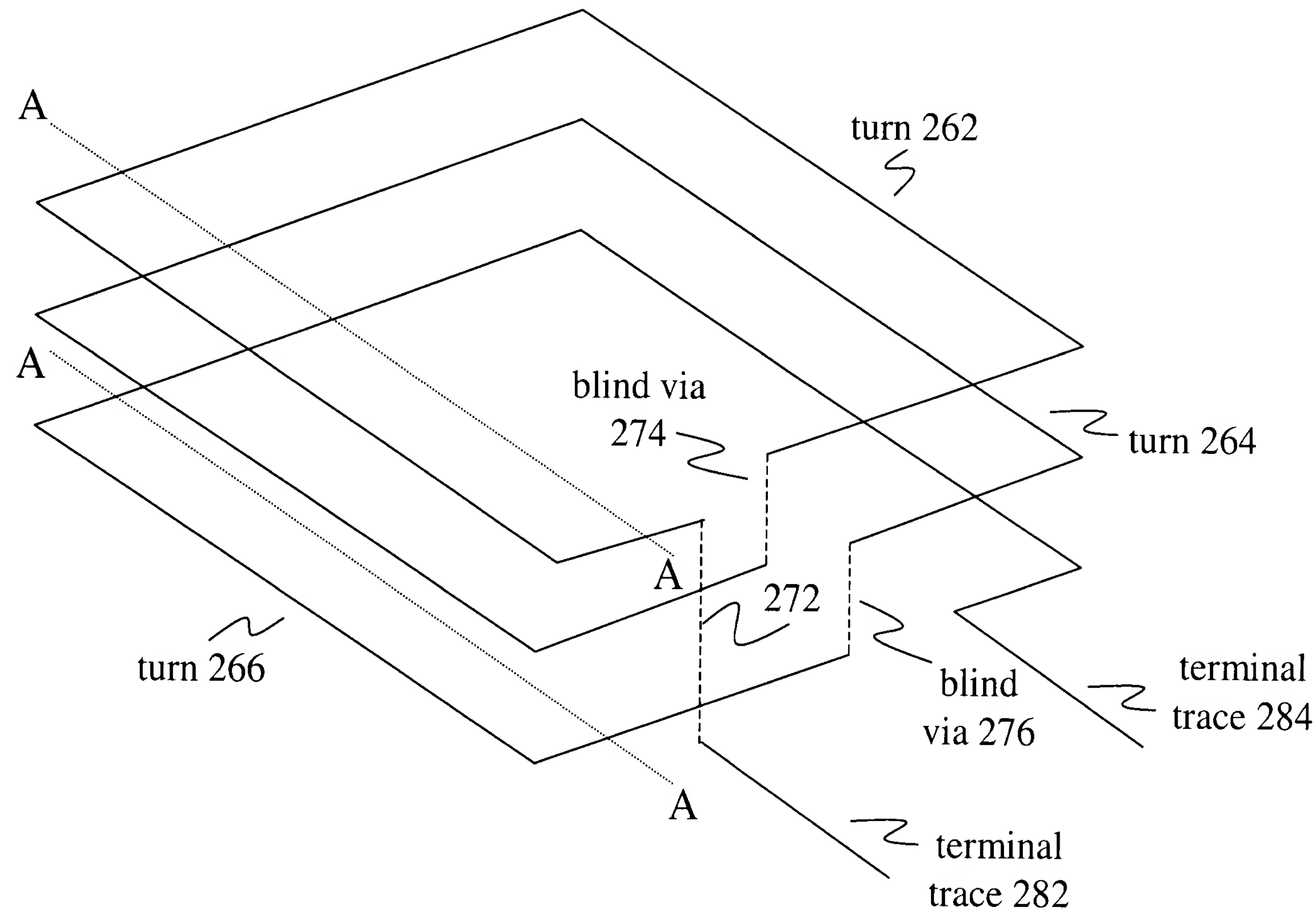


FIG. 12

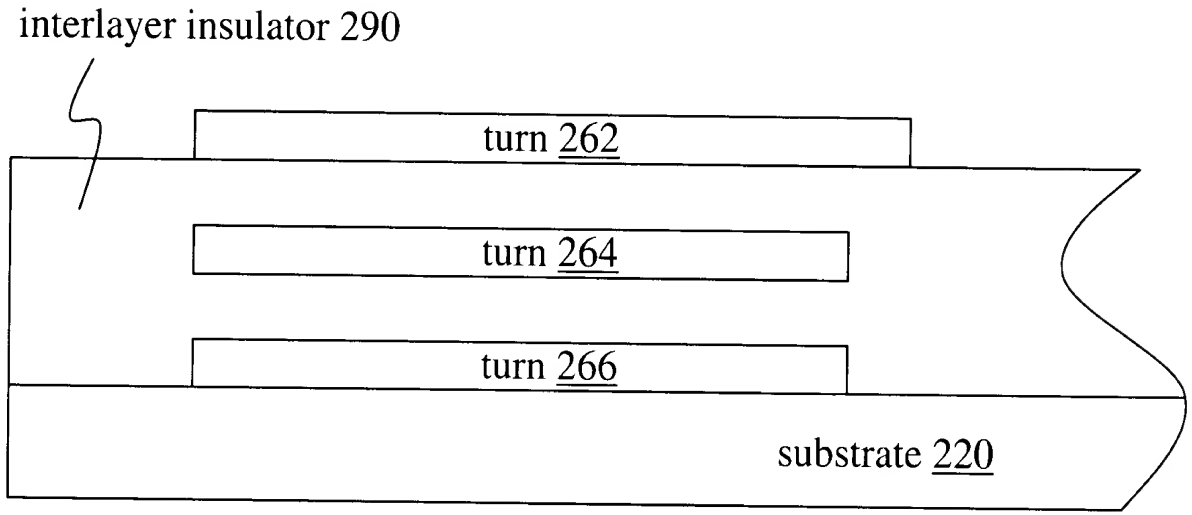


FIG. 13

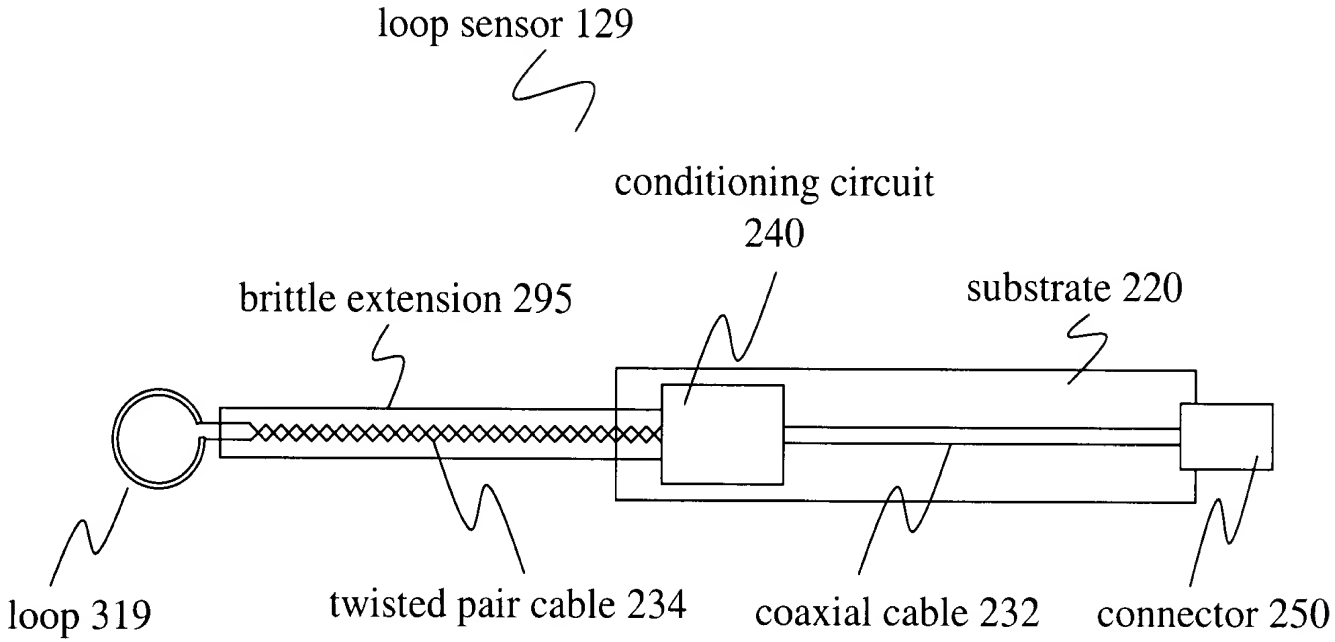

loop sensor 129
conditioning circuit
240
brittle extension 295
substrate 220
loop 319
twisted pair cable 234
coaxial cable 232
connector 250

FIG. 14

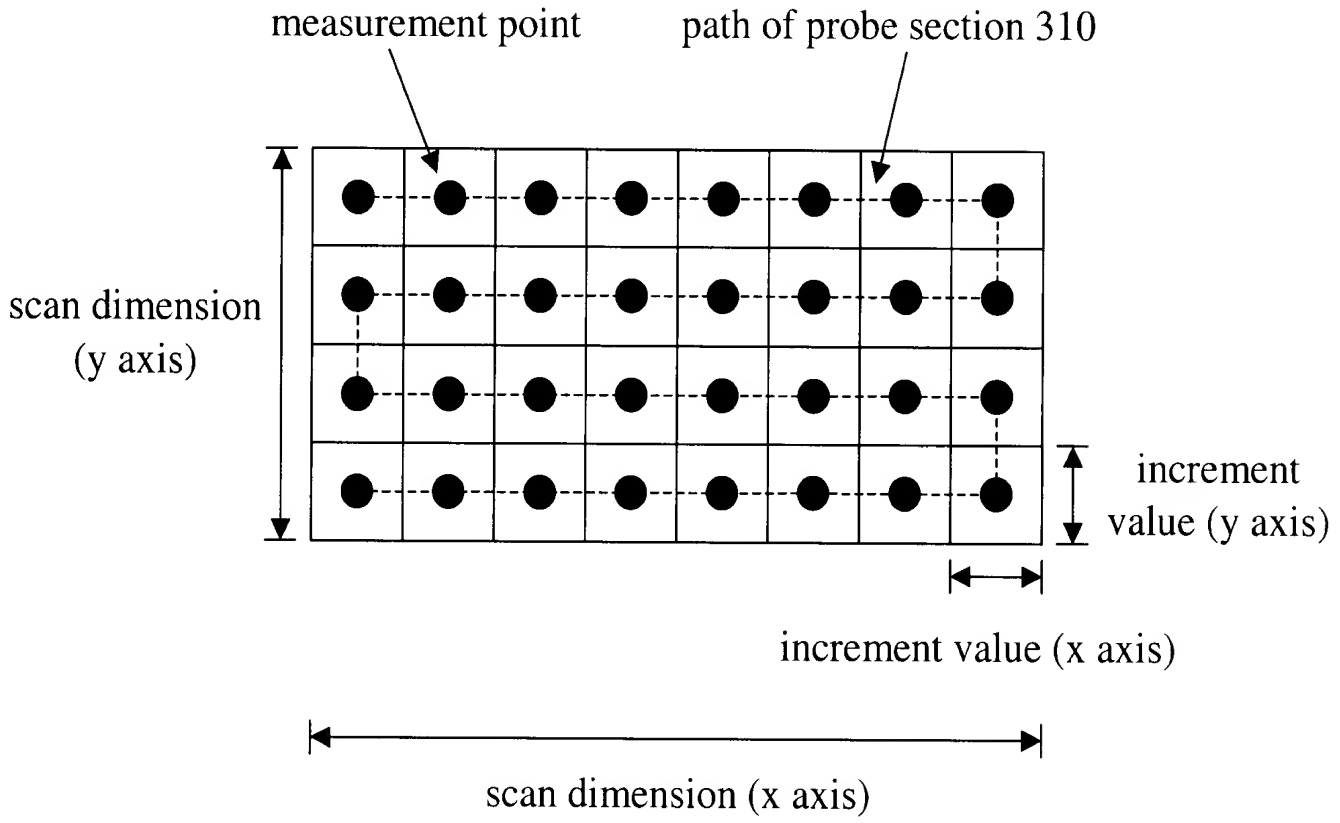

measurement point
path of probe section 310
scan dimension
(y axis)
increment
value (y axis)
increment value (x axis)
scan dimension (x axis)

FIG. 15

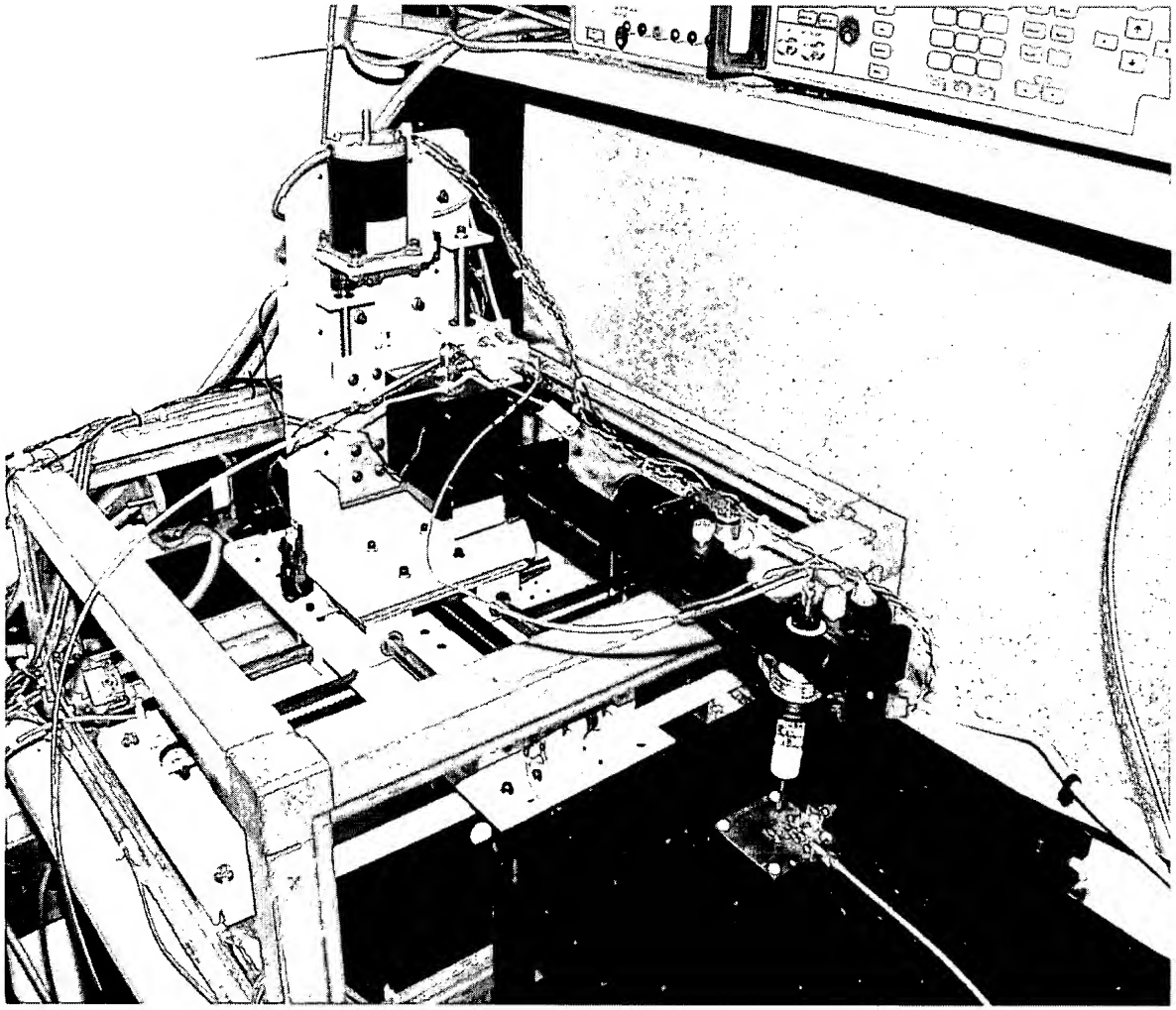


FIG. 16

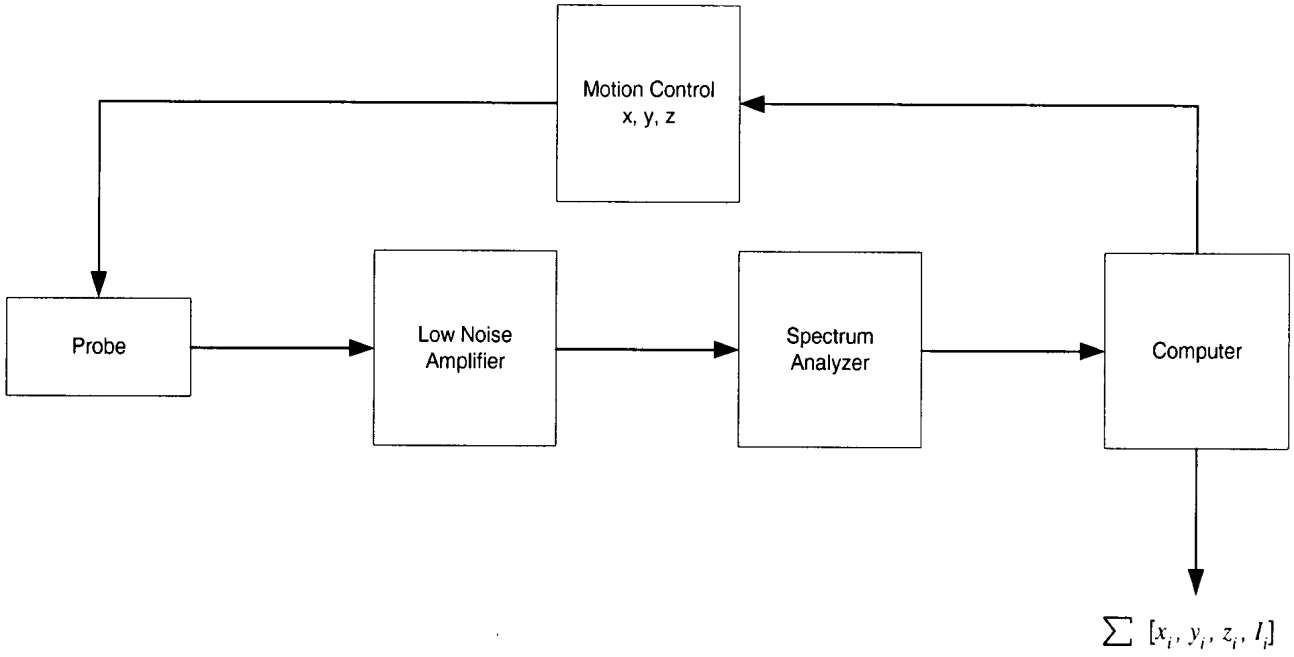


FIG. 17

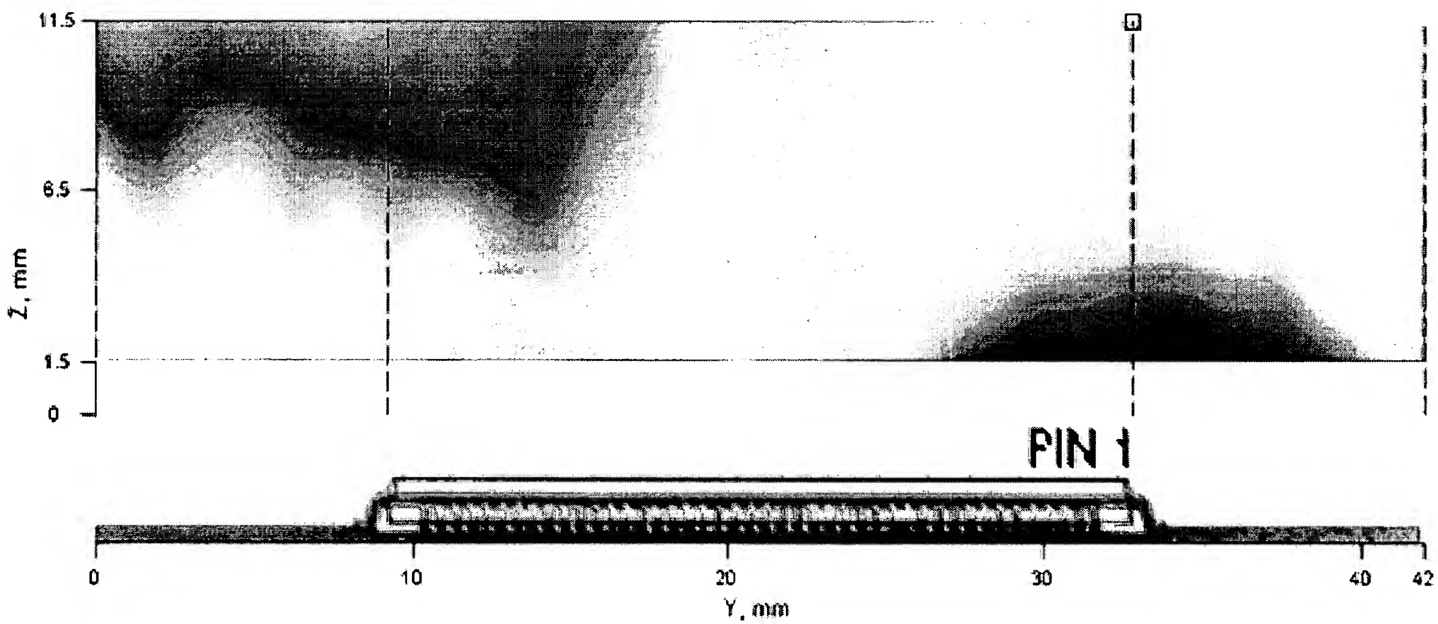


FIG. 18

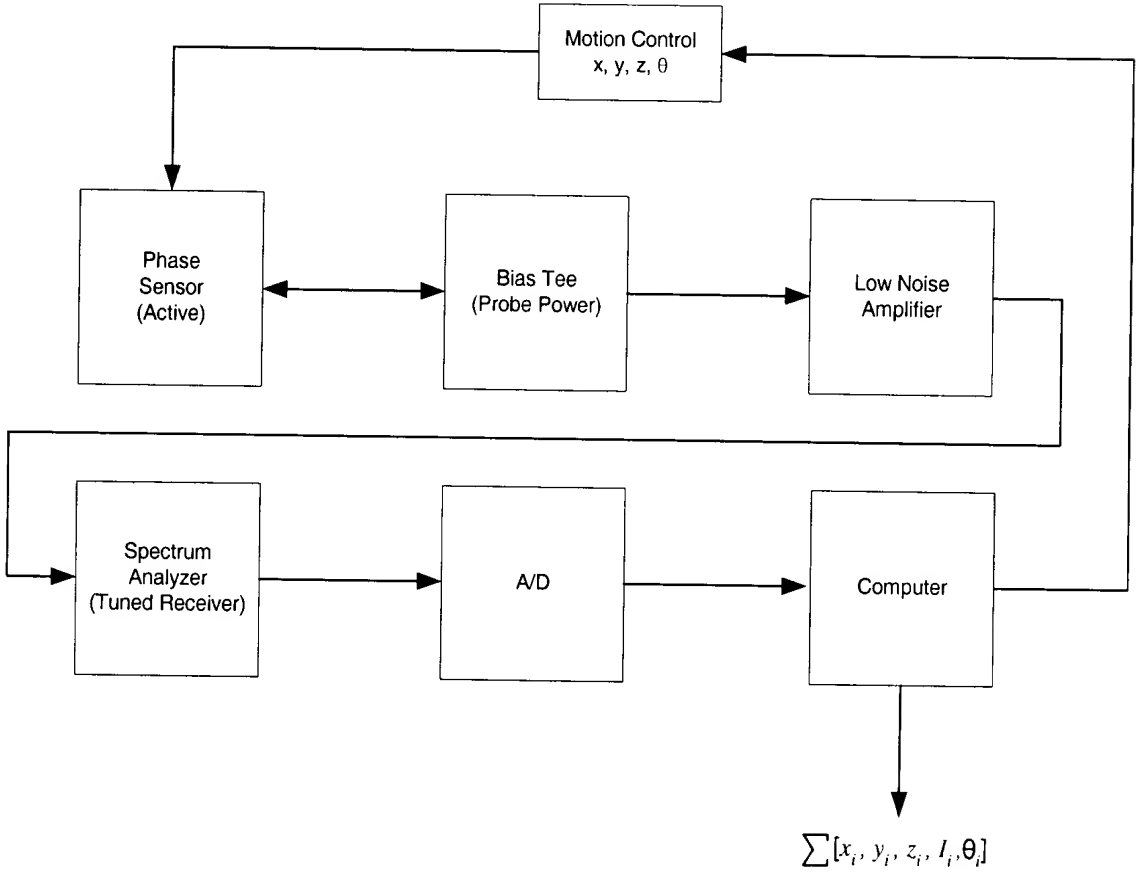


FIG. 19

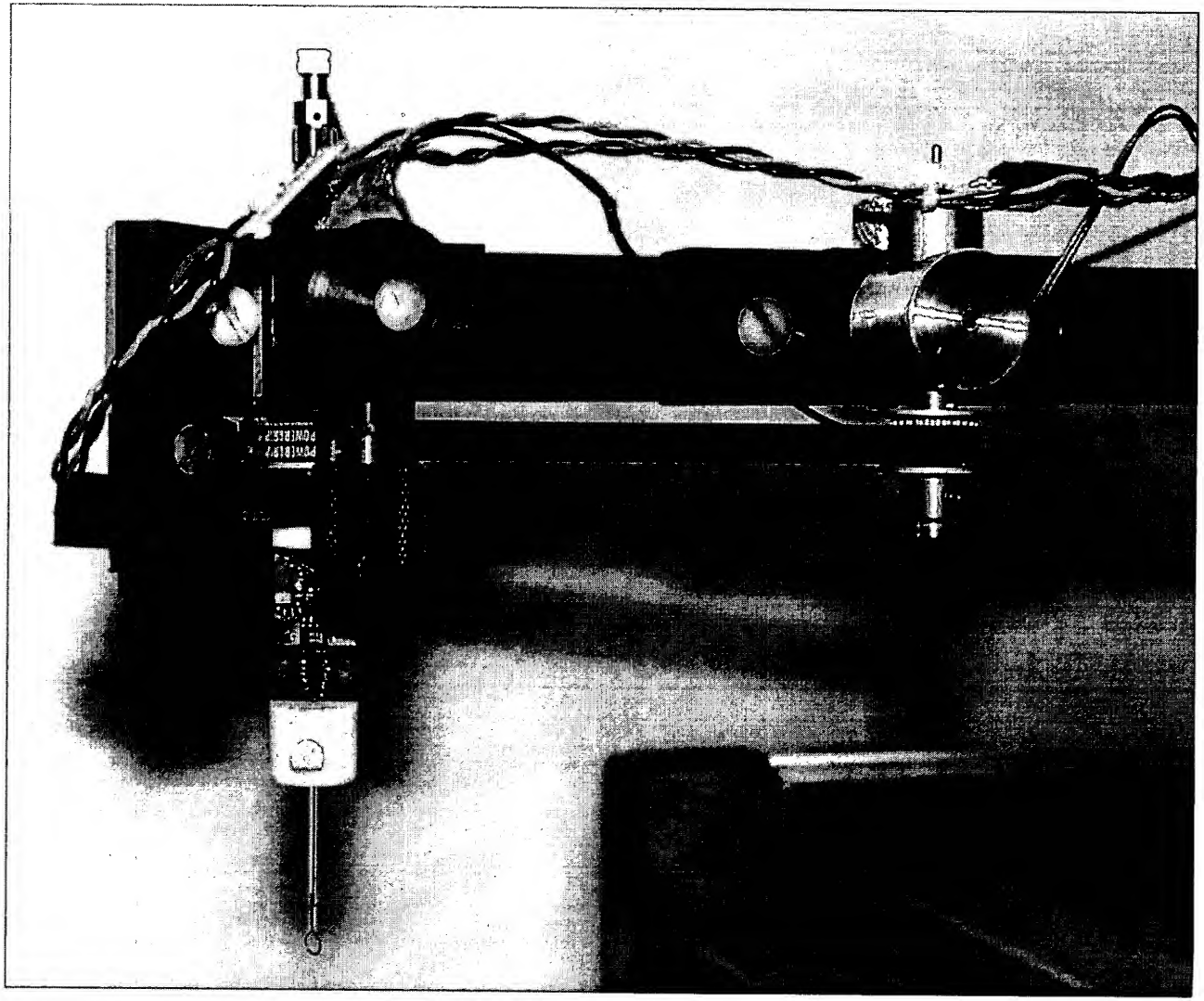


FIG. 20

11/16/99 - Micro stripline is terminated in 50 ohms. Frequency: 1000 MHz
Probe Type: Magnetic Field. Measurement Increments: dx: 1.94 mm, dy: 1.97 mm, dz: 0 mm
Number of Planes: 1, at 14.52 mm above DUT. Magnetic Field Intensity Unit: dB uA/m.

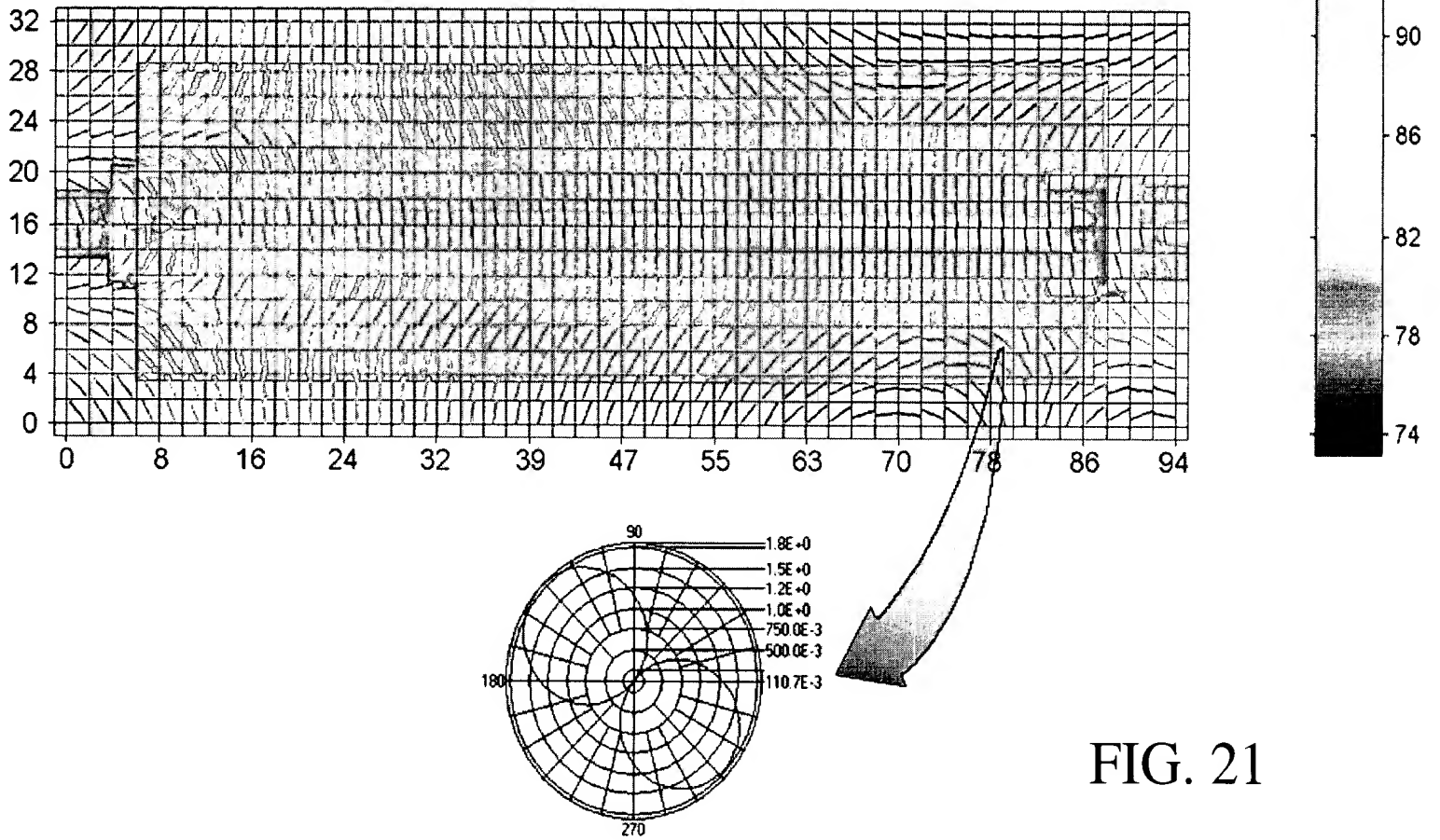


FIG. 21

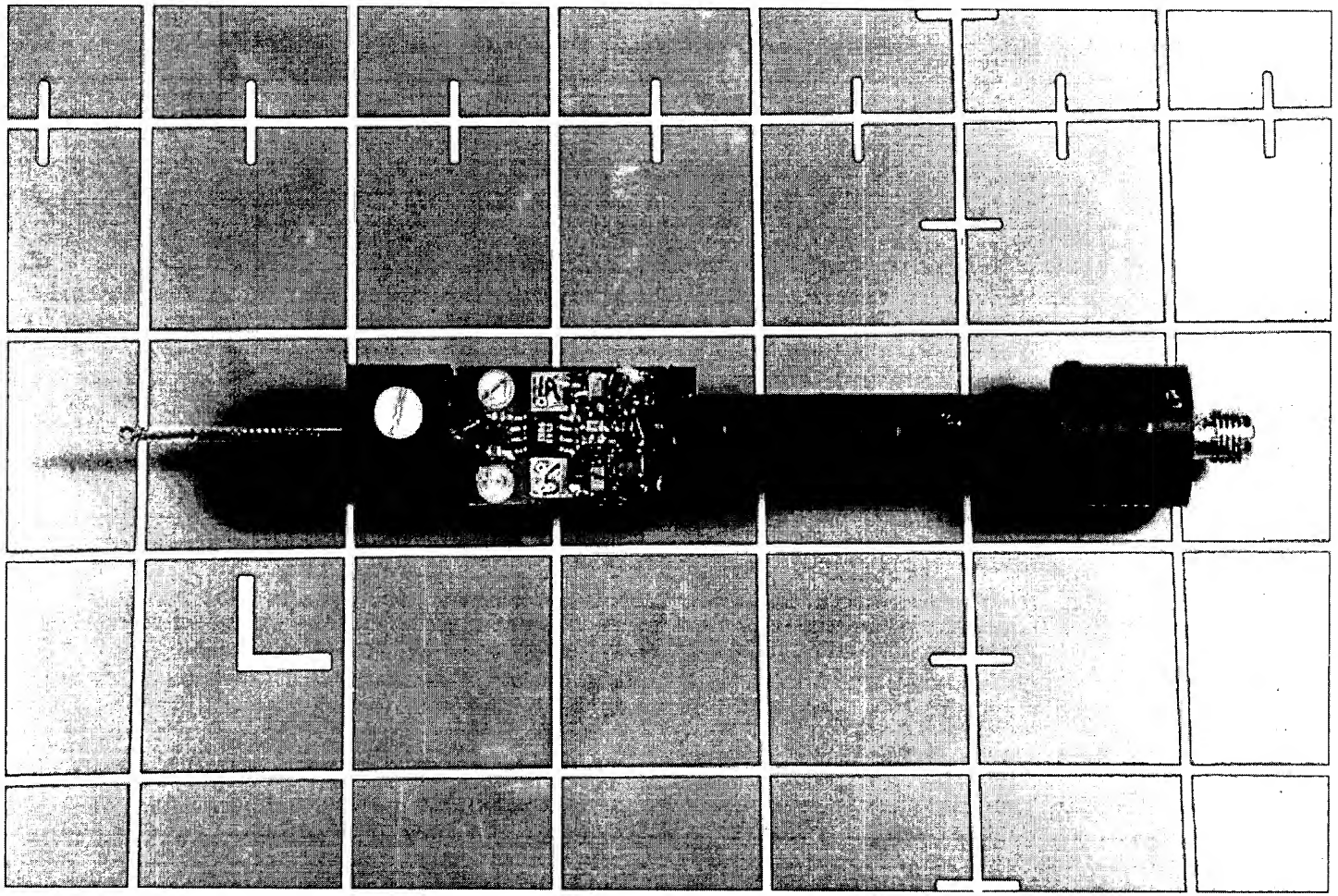


FIG. 22

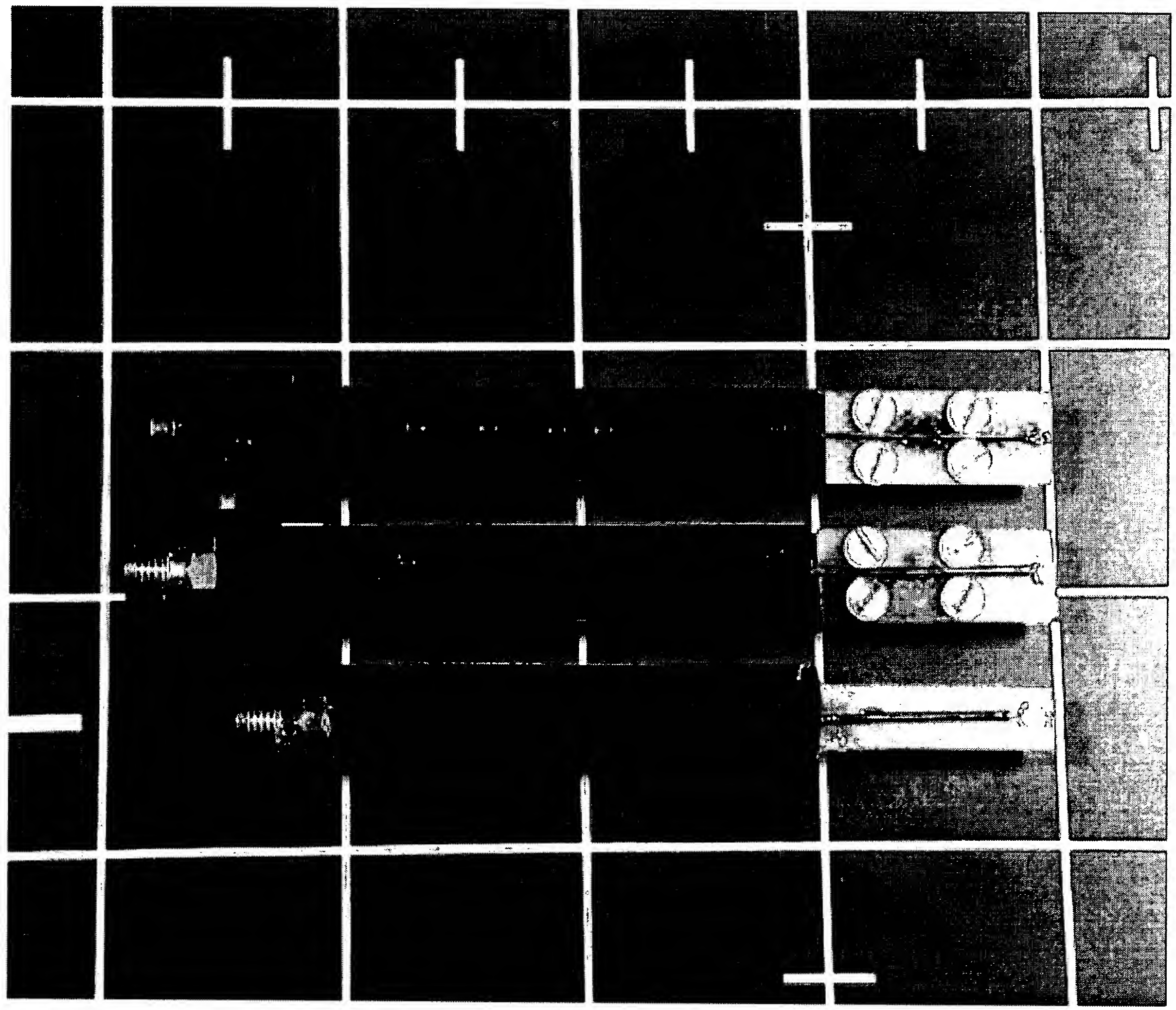


FIG. 23

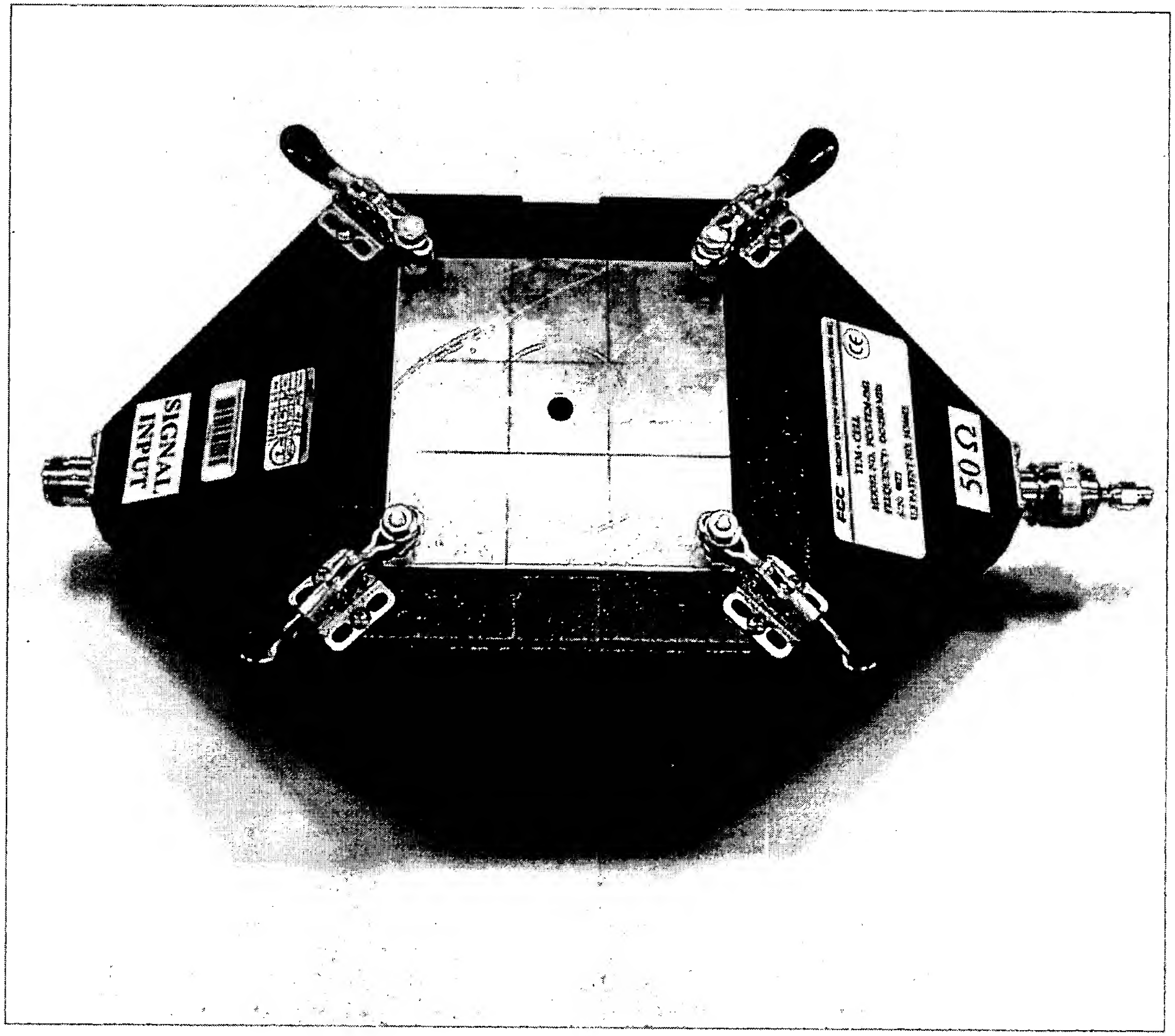


FIG. 24

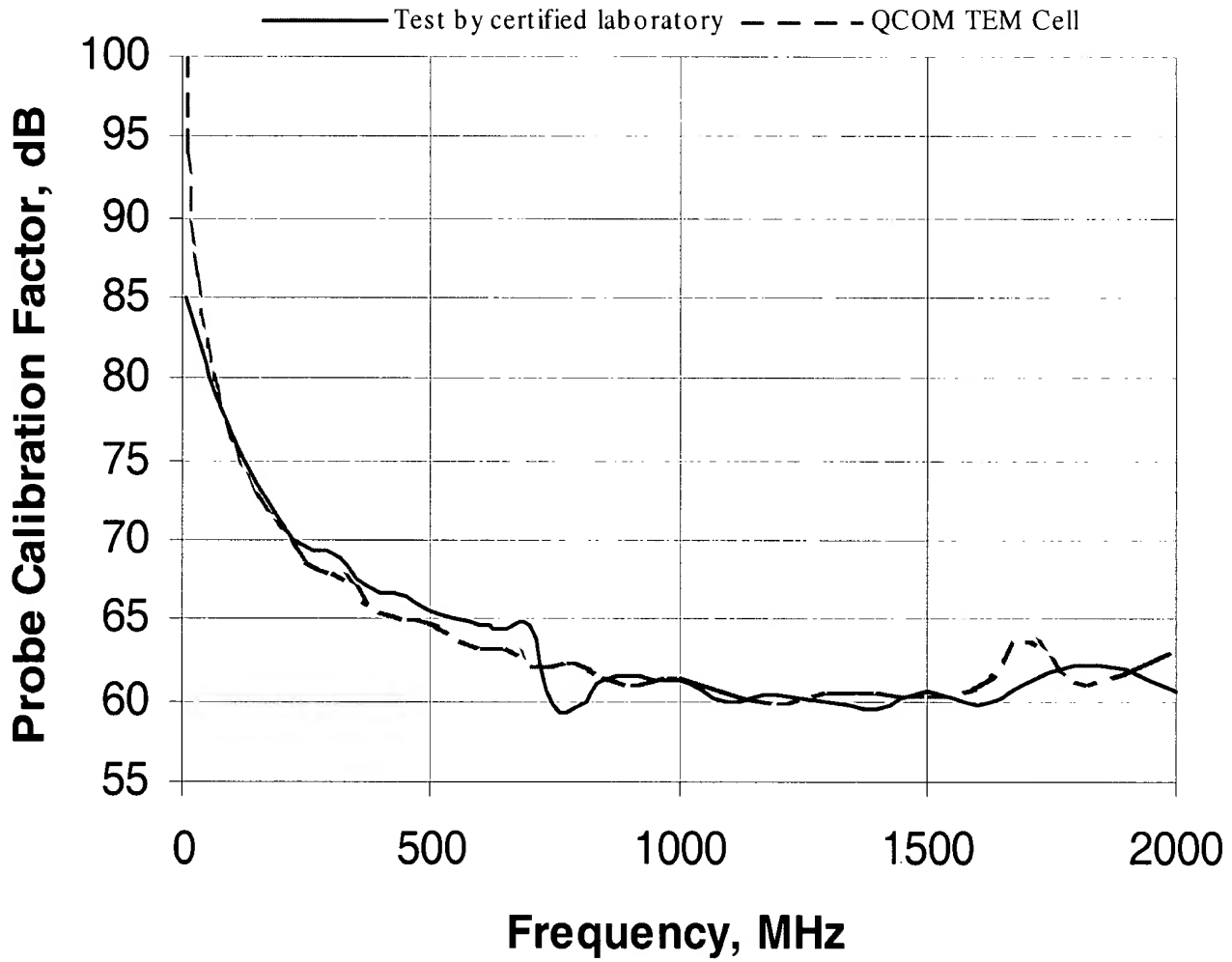

Test by certified laboratory
QCOM TEM Cell
Probe Calibration Factor, dB
100
95
90
85
80
75
70
65
60
55
0
500
1000
1500
2000
Frequency, MHz

FIG. 25

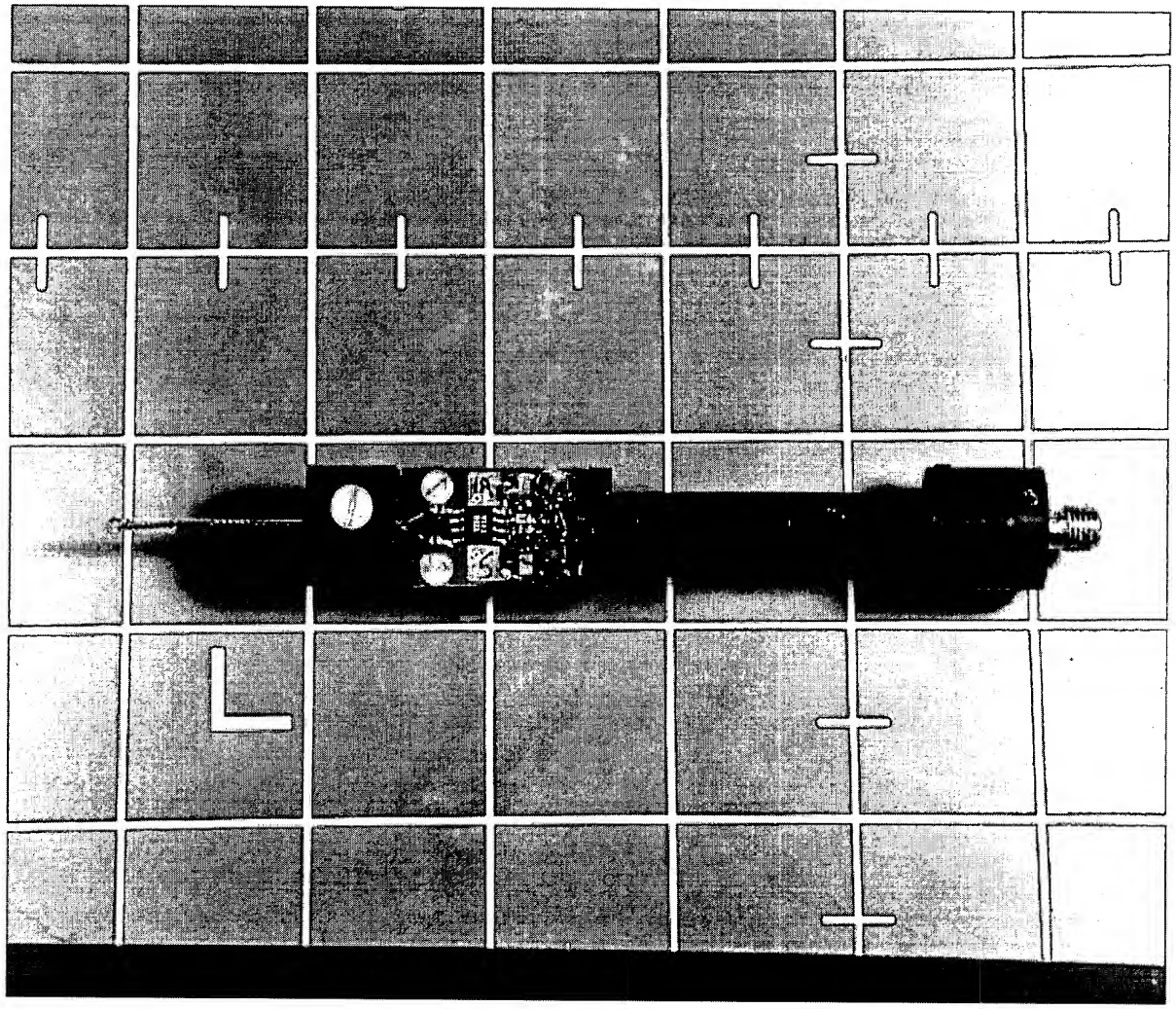


FIG. 26

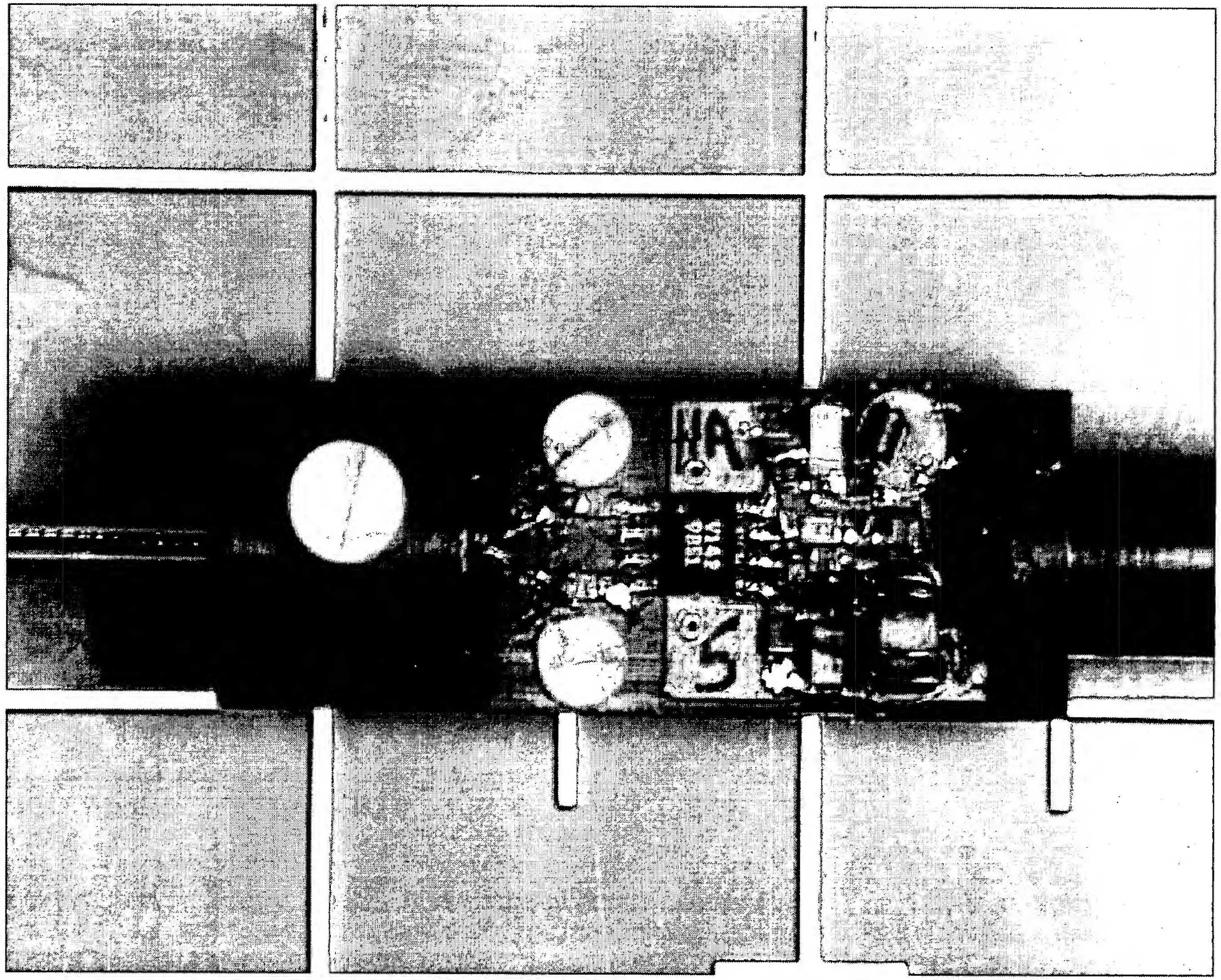


FIG. 27

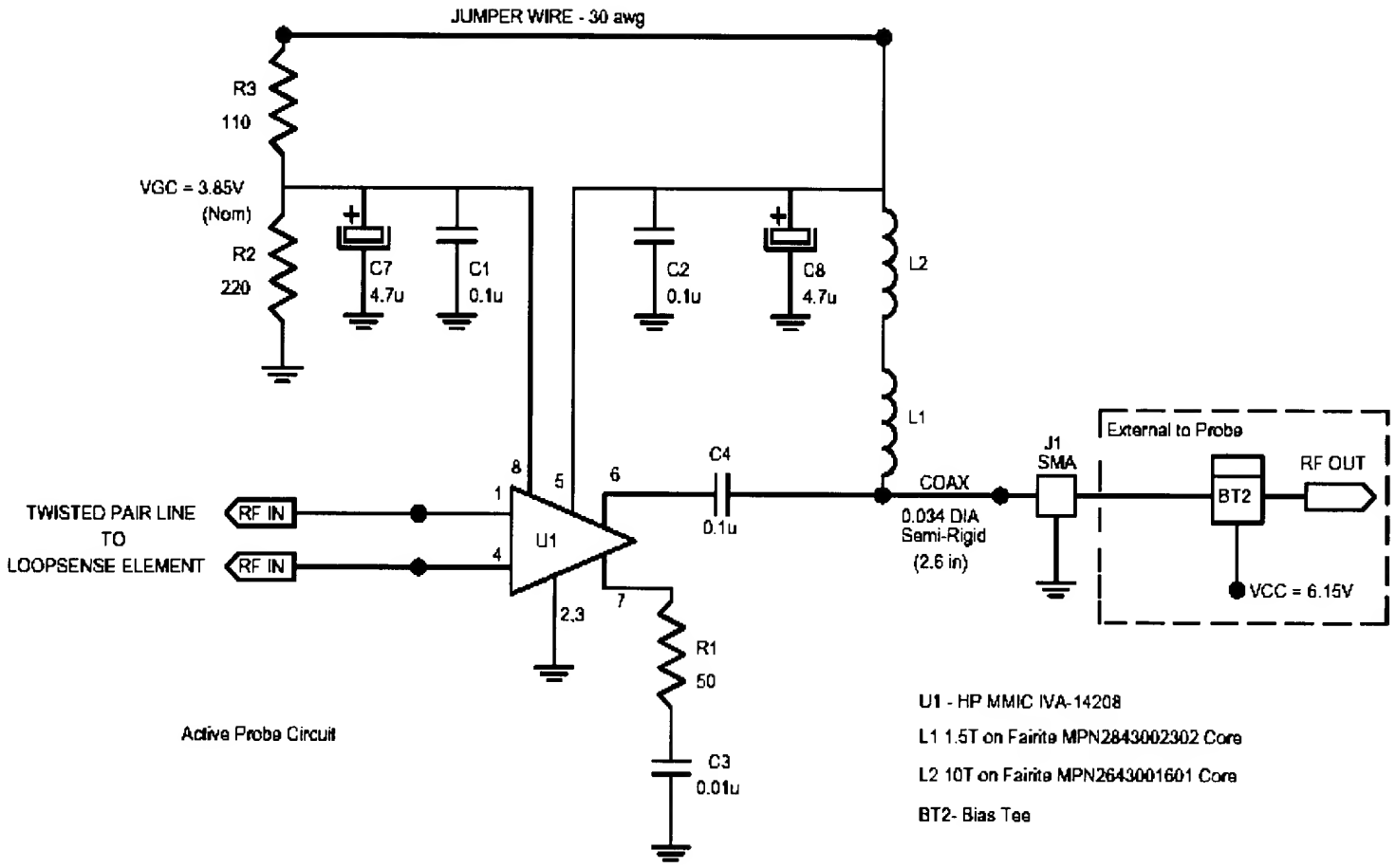


FIG. 28

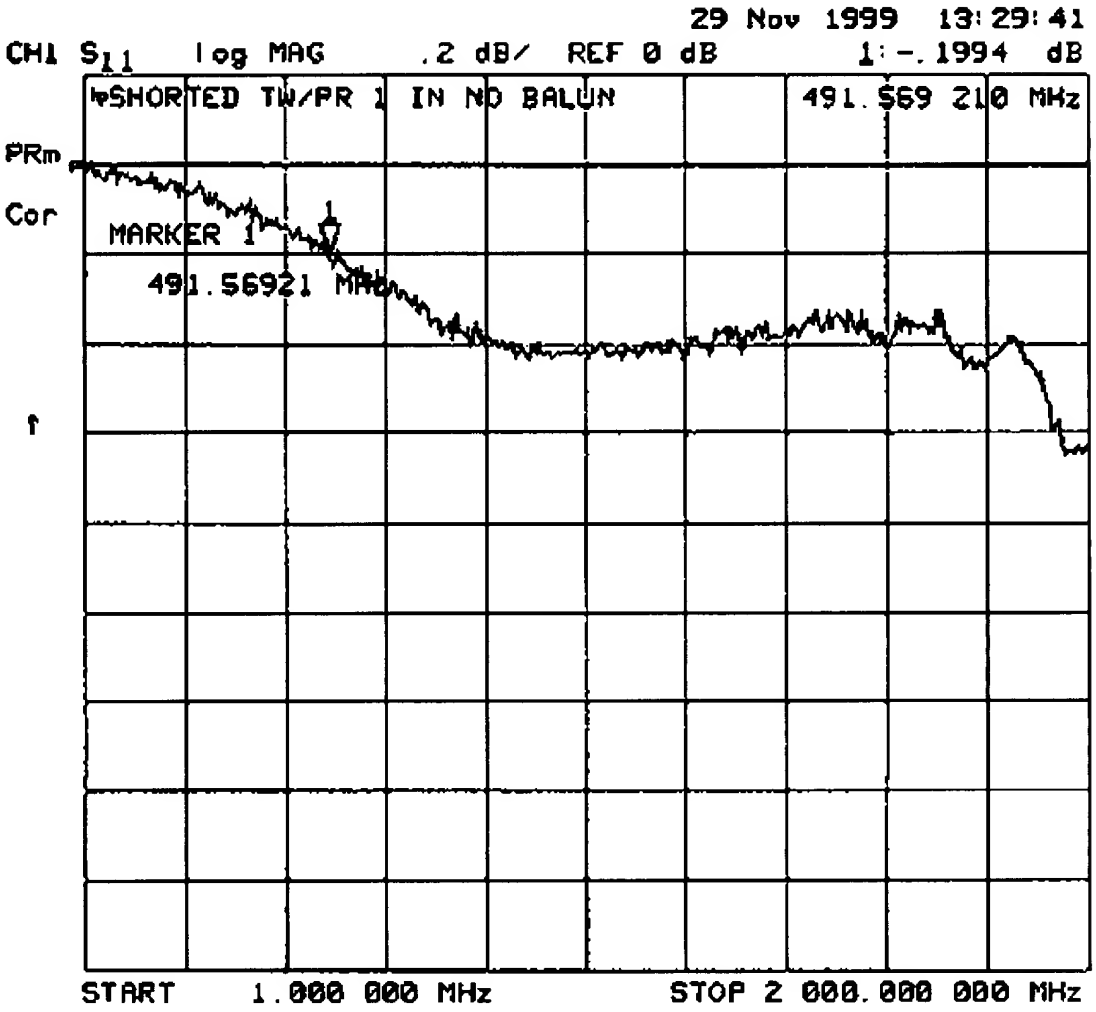
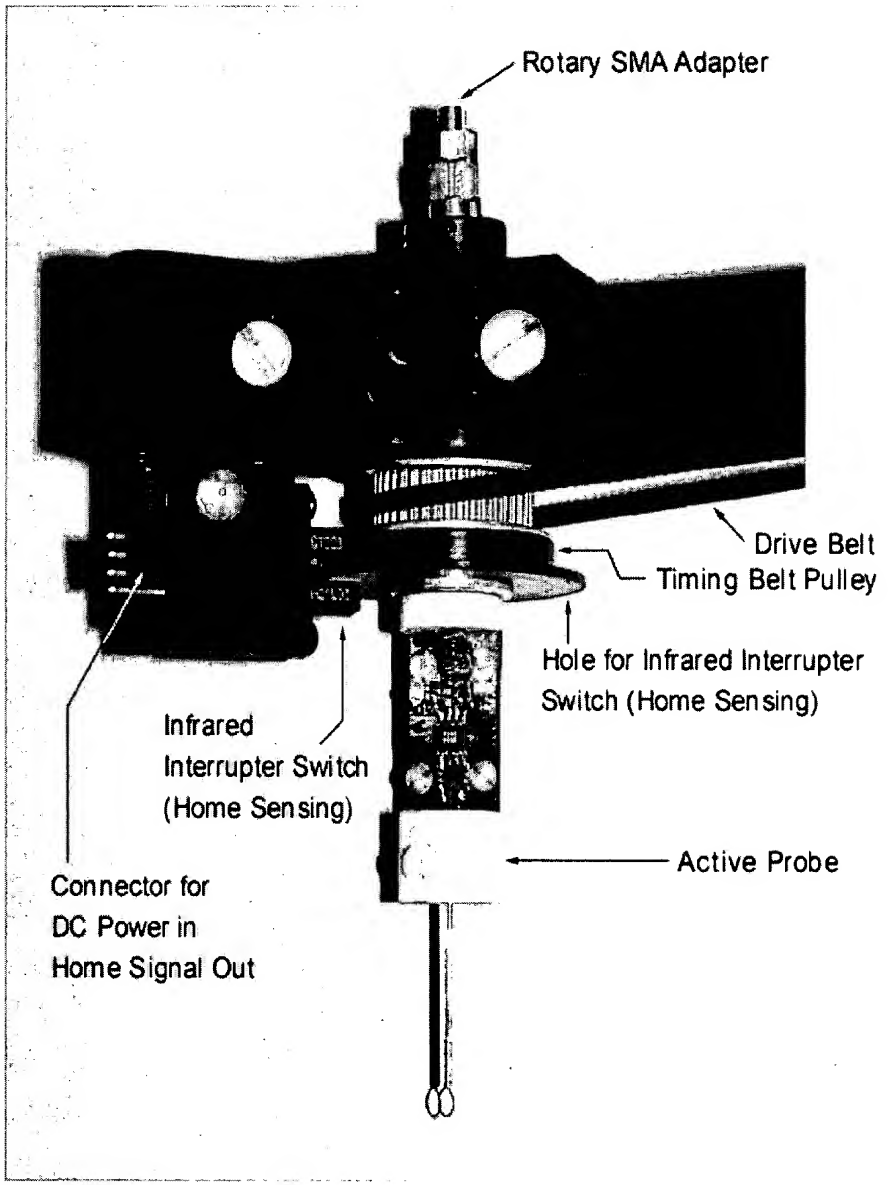


FIG. 29

FIG. 30



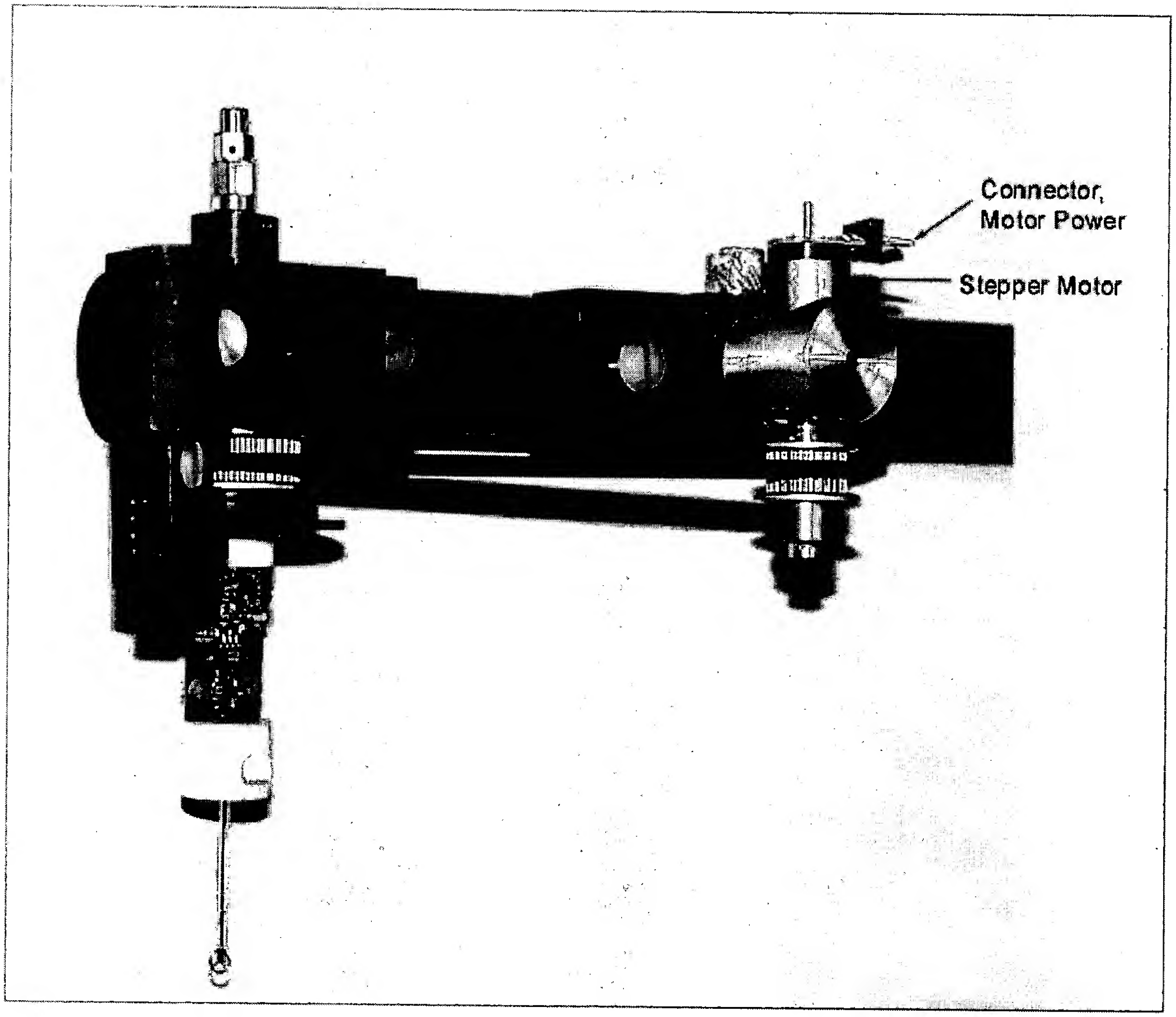


FIG. 31

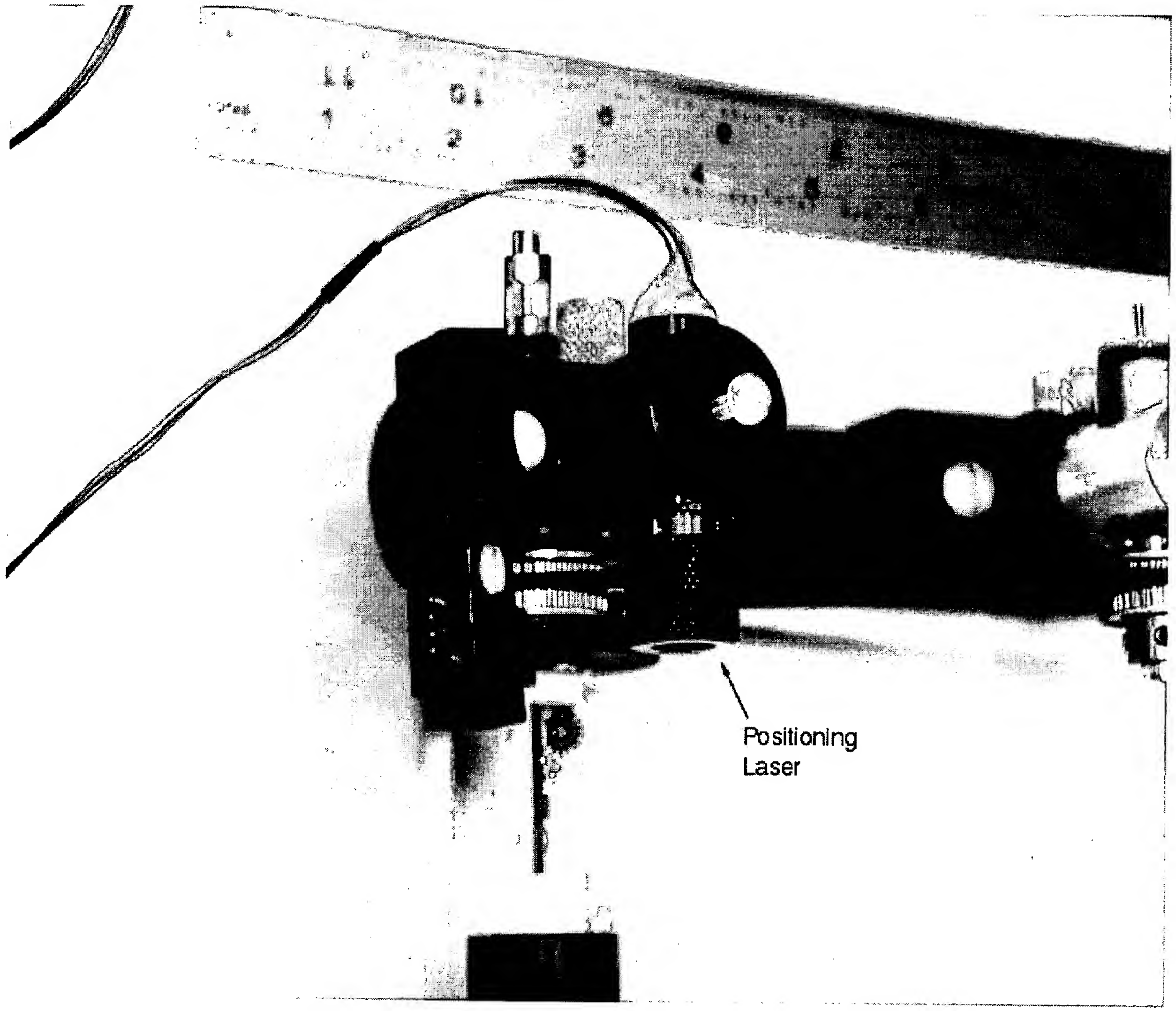


FIG. 32

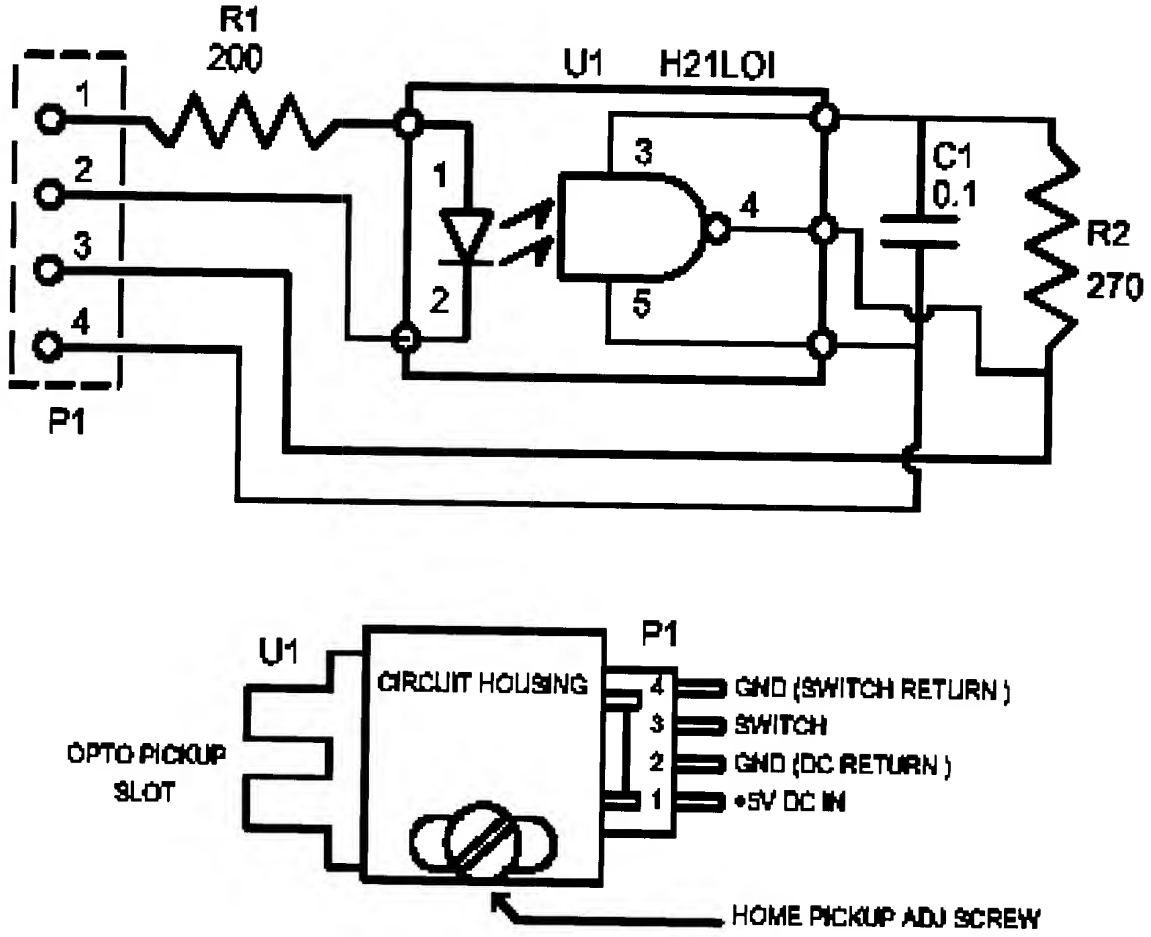


FIG. 33

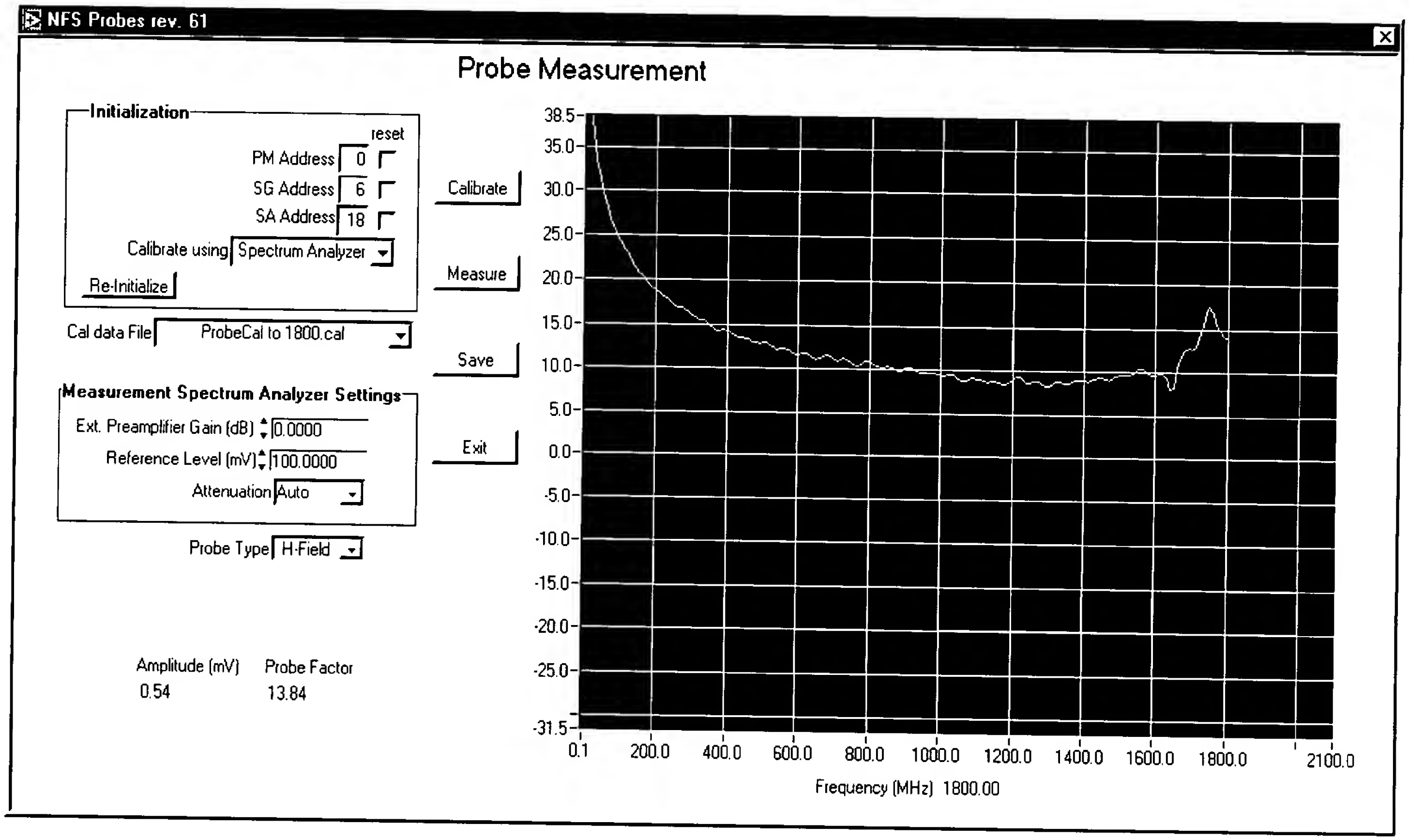
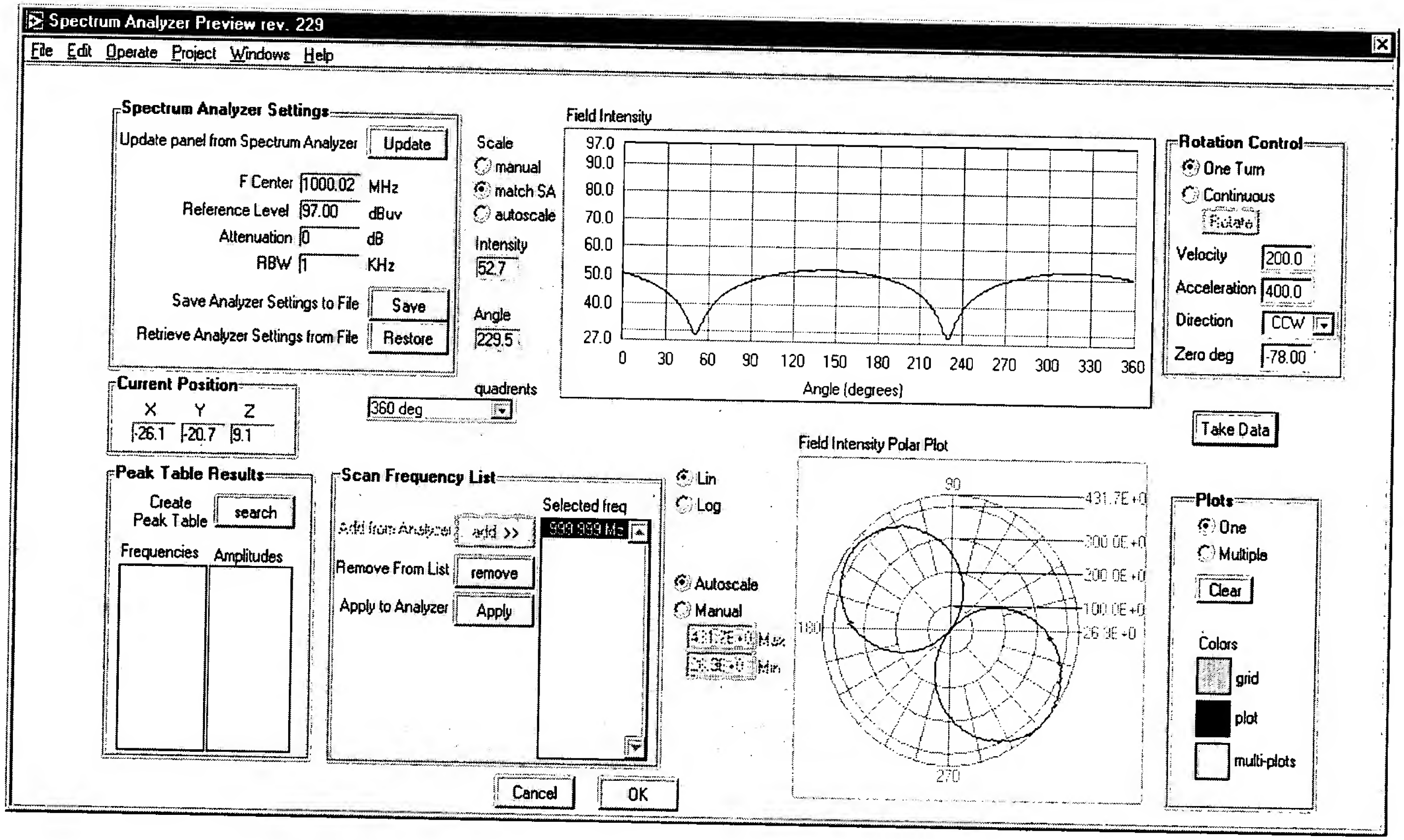

NFS Probes rev. 61
Probe Measurement
Initialization
reset
PM Address 0
SG Address 6
SA Address 18
Calibrate using Spectrum Analyzer
Re-Initialize
Cal data File ProbeCal to 1800.cal
Measurement Spectrum Analyzer Settings
Ext. Preamplifier Gain (dB) 0.0000
Reference Level (mV) 100.0000
Attenuation Auto
Probe Type H-Field
Amplitude (mV) 0.54
Probe Factor 13.84
Calibrate
Measure
Save
Exit
38.5
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-31.5
0.1
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
1600.0
1800.0
2100.0
Frequency (MHz) 1800.00

FIG. 34



Spectrum Analyzer Preview rev. 229
File Edit Operate Project Windows Help
Spectrum Analyzer Settings
Update panel from Spectrum Analyzer
Update
F Center 1000.02 MHz
Reference Level 97.00 dBuv
Attenuation 0 dB
RBW 1 KHz
Save Analyzer Settings to File
Save
Retrieve Analyzer Settings from File
Restore
Scale
manual
match SA
autoscale
Intensity
52.7
Angle
229.5
quadrents
360 deg
Field Intensity
97.0
90.0
80.0
70.0
60.0
50.0
40.0
27.0
0 30 60 90 120 150 180 210 240 270 300 330 360
Angle (degrees)
Rotation Control
One Turn
Continuous
Velocity 200.0
Acceleration 400.0
Direction CCW
Zero deg -78.00
Take Data
Current Position
X Y Z
-26.1 -20.7 9.1
Peak Table Results
Create Peak Table
search
Frequencies
Amplitudes
Scan Frequency List
Selected freq
add >>
Remove From List
remove
Apply to Analyzer
Apply
Lin
Log
Autoscale
Manual
Max
Min
Field Intensity Polar Plot
90
180
270
431.7E+0
Plots
One
Multiple
Clear
Colors
grid
plot
multi-plots
Cancel
OK

FIG. 35

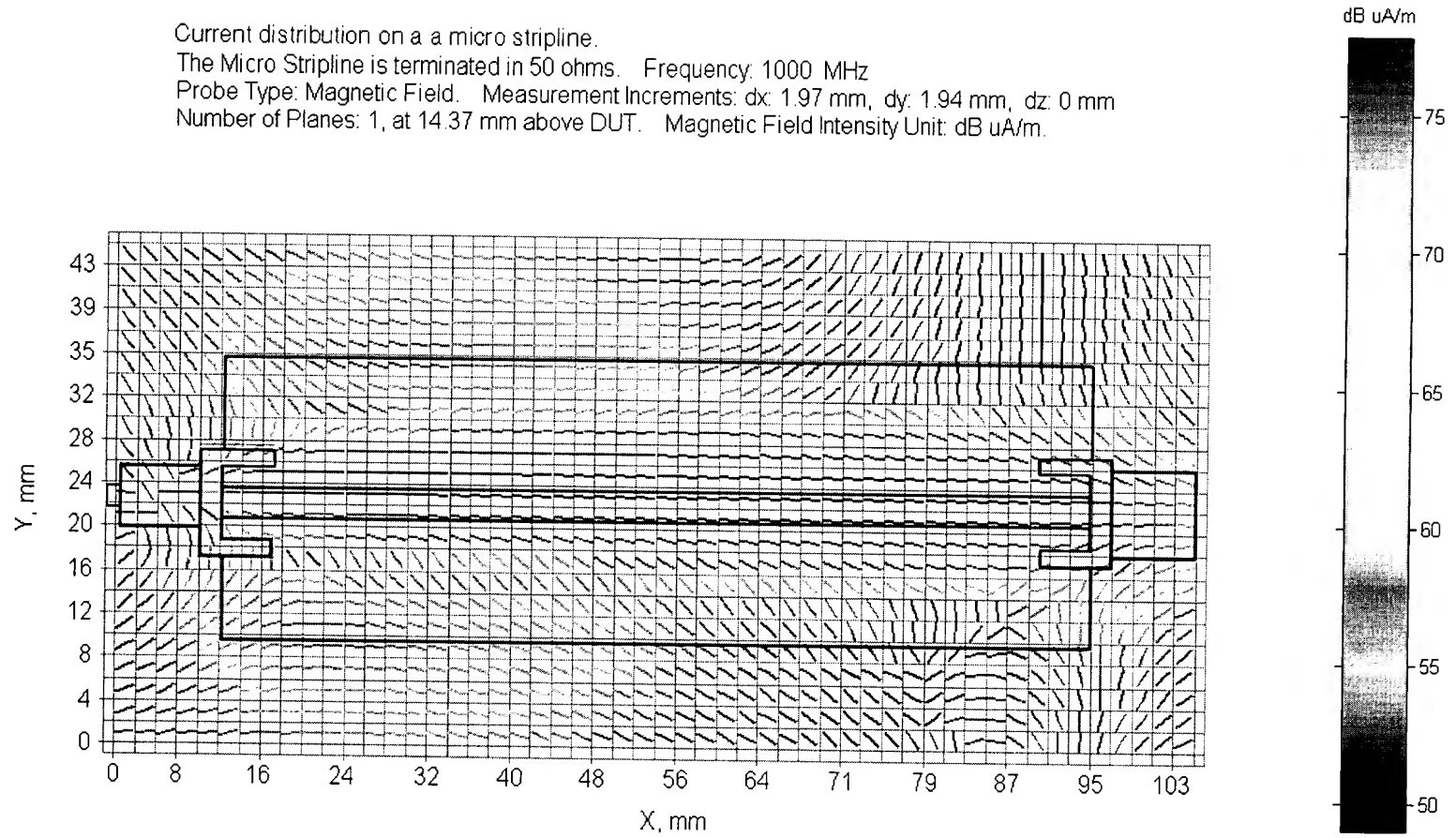

Current distribution on a a micro stripline.
The Micro Stripline is terminated in 50 ohms. Frequency: 1000 MHz
Probe Type: Magnetic Field. Measurement Increments: dx: 1.97 mm, dy: 1.94 mm, dz: 0 mm
Number of Planes: 1, at 14.37 mm above DUT. Magnetic Field Intensity Unit: dB uA/m.
dB uA/m
75
70
65
60
55
50
Y, mm
43
39
35
32
28
24
20
16
12
8
4
0
0
8
16
24
32
40
48
56
64
71
79
87
95
103
X, mm

FIG. 36

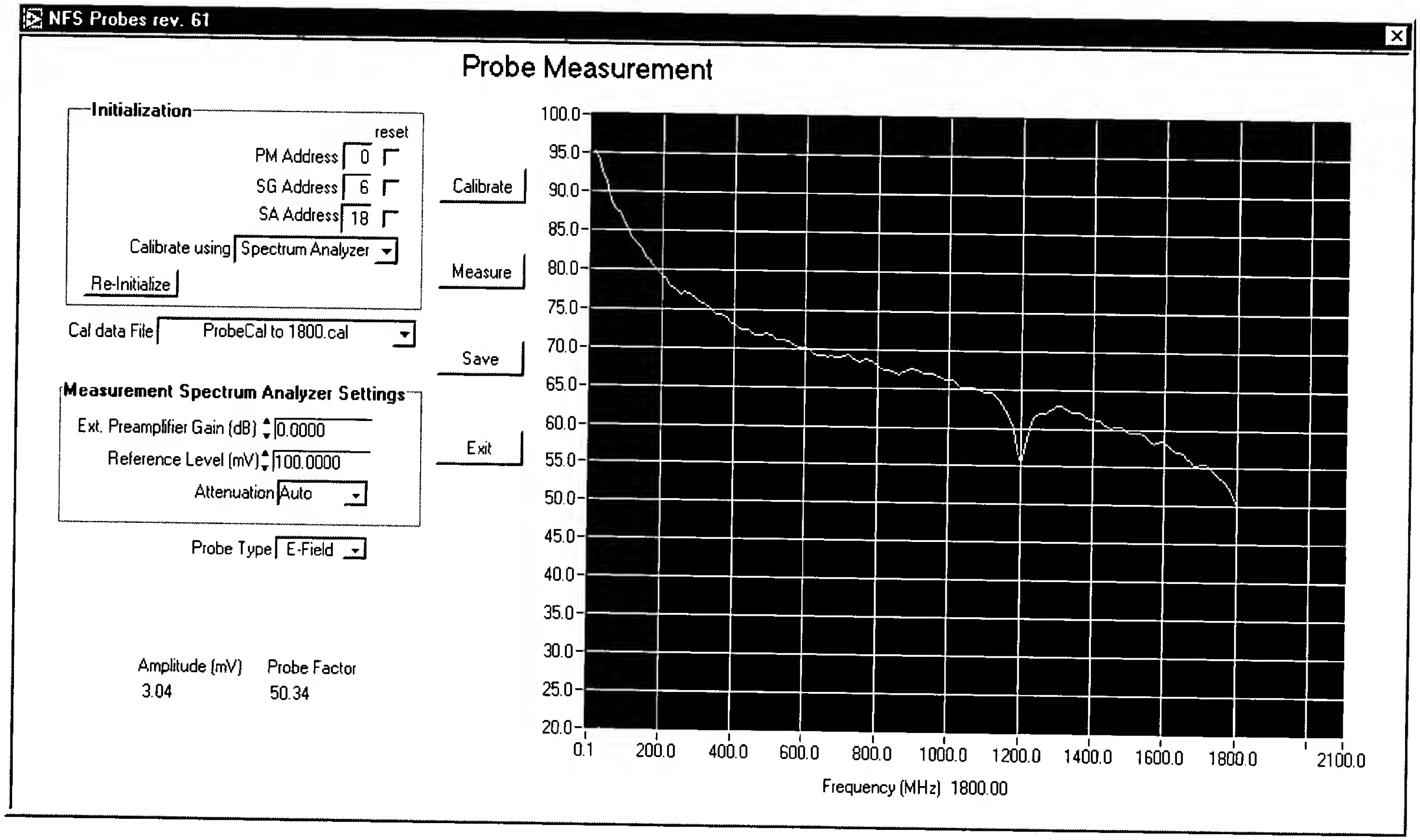

NFS Probes rev. 61
Probe Measurement
Initialization
reset
PM Address 0
SG Address 6
SA Address 18
Calibrate using Spectrum Analyzer
Re-Initialize
Cal data File ProbeCal to 1800.cal
Measurement Spectrum Analyzer Settings
Ext. Preamplifier Gain (dB) 0.0000
Reference Level (mV) 100.0000
Attenuation Auto
Probe Type E-Field
Amplitude (mV) 3.04
Probe Factor 50.34
Calibrate
Measure
Save
Exit
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
0.1
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
1600.0
1800.0
2100.0
Frequency (MHz) 1800.00

FIG. 37

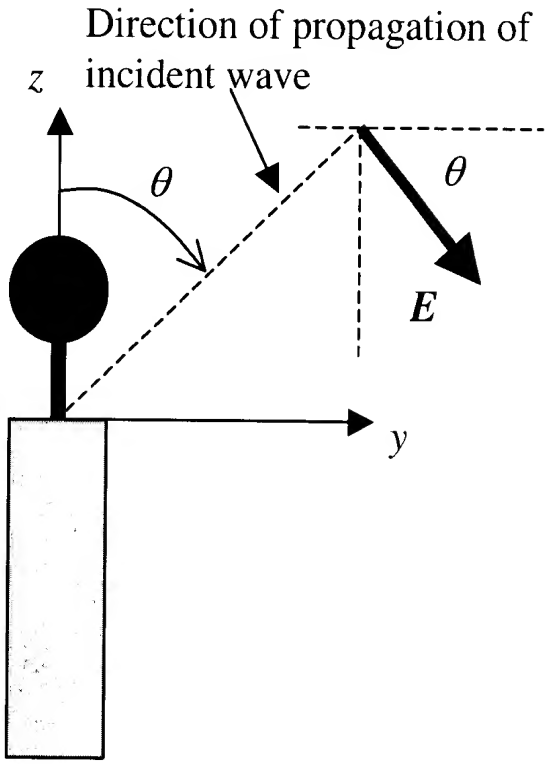


FIG. 38

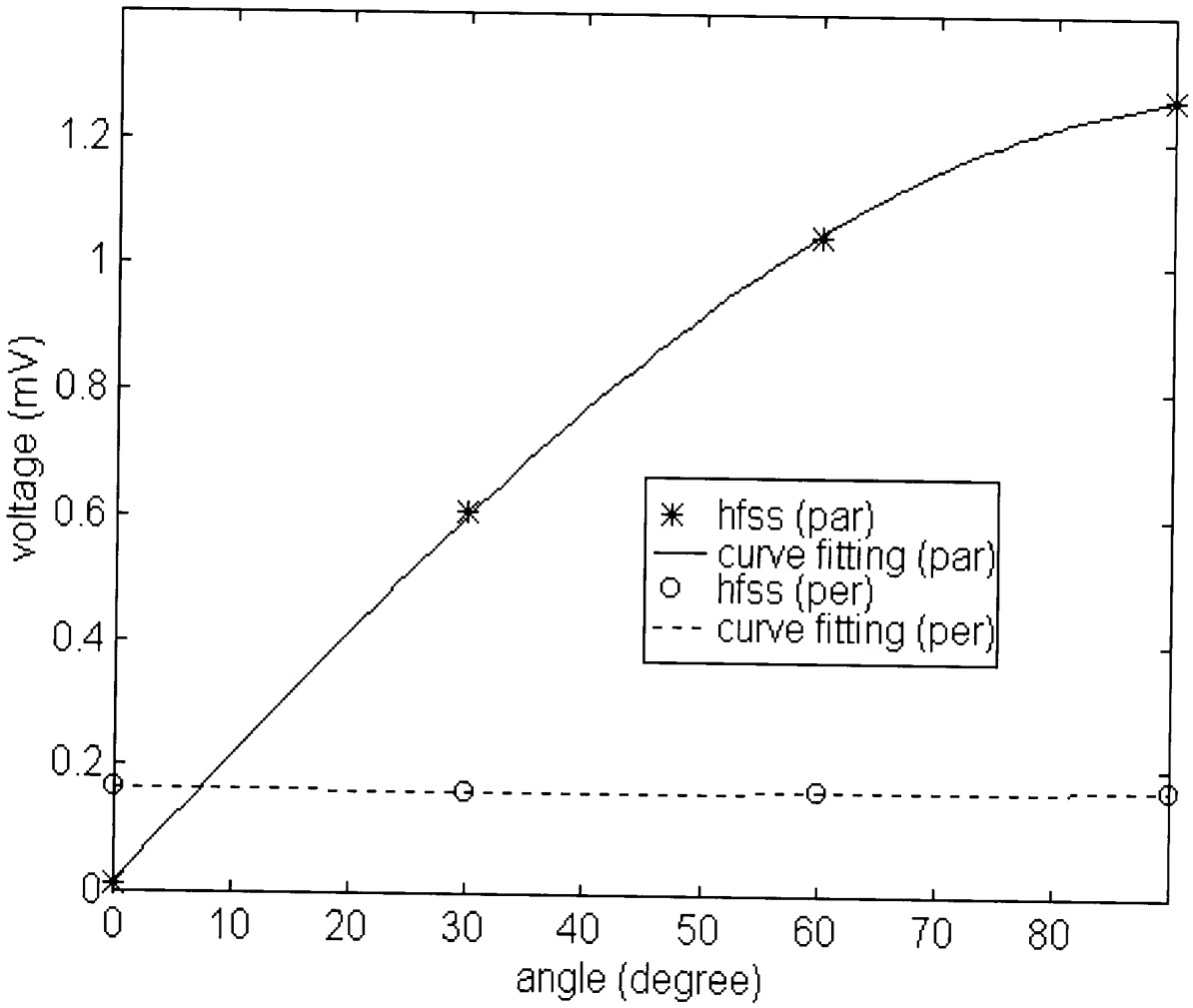

voltage (mV)
angle (degree)
0
0.2
0.4
0.6
0.8
1
1.2
0
10
20
30
40
50
60
70
80
hfss (par)
curve fitting (par)
hfss (per)
curve fitting (per)

FIG. 39

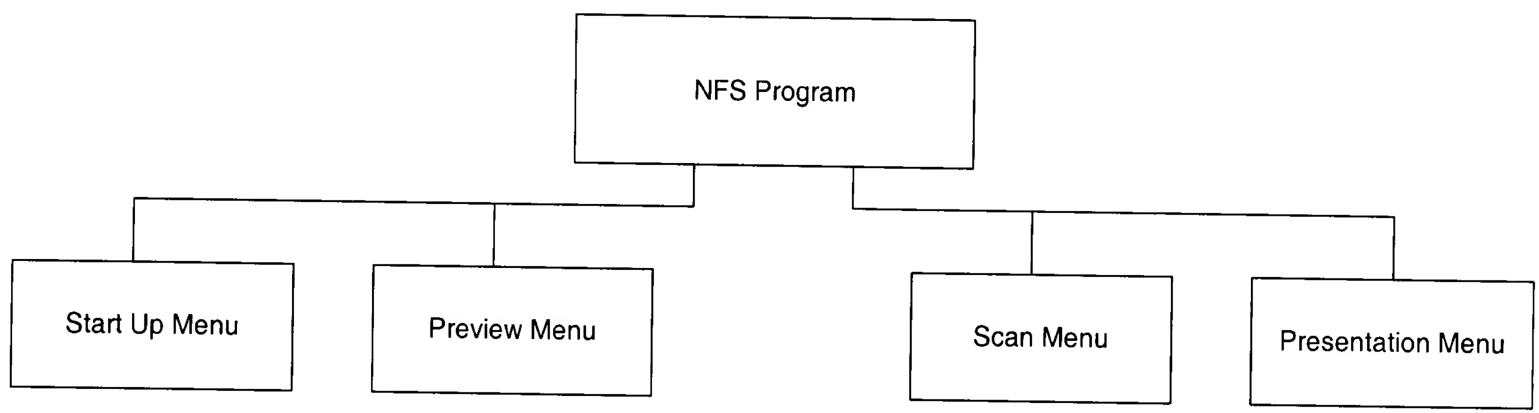

NFS Program
Start Up Menu
Preview Menu
Scan Menu
Presentation Menu

FIG. 40

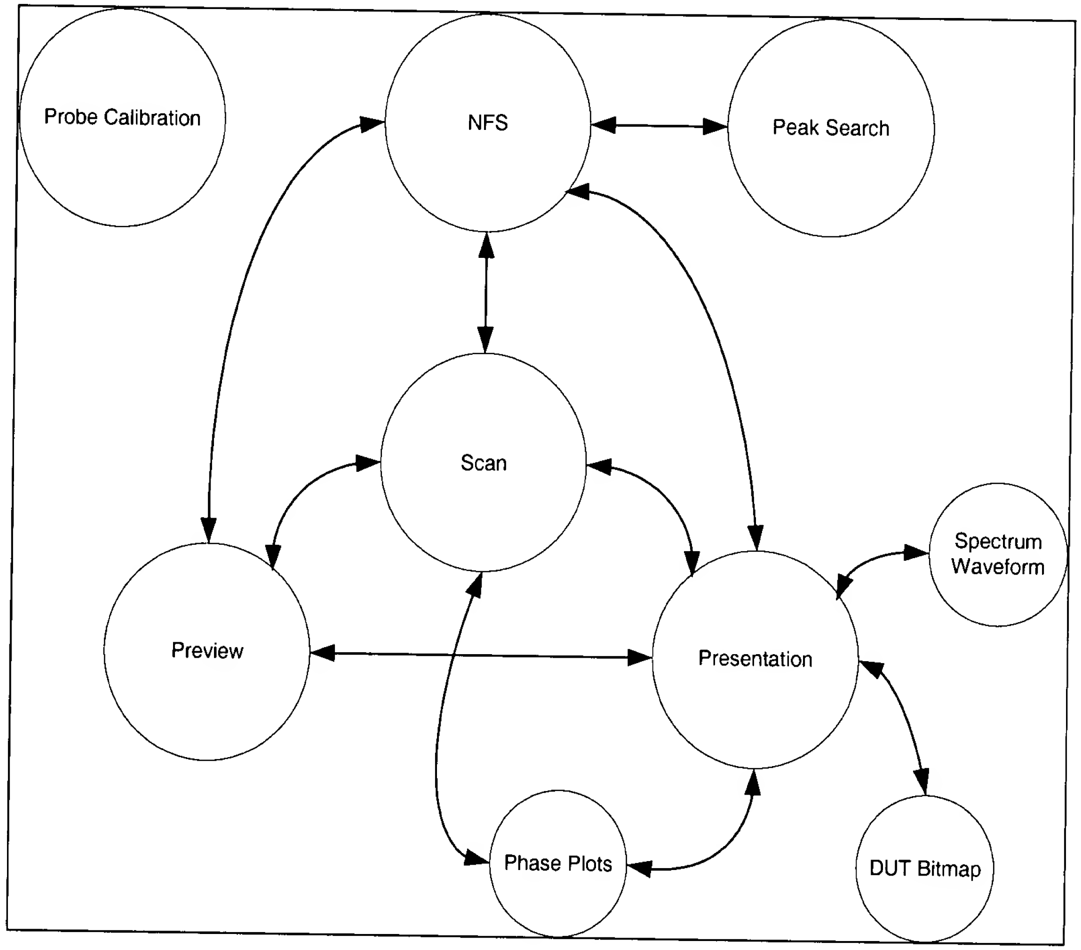

Probe Calibration
NFS
Peak Search
Scan
Preview
Presentation
Spectrum
Waveform
Phase Plots
DUT Bitmap

FIG. 41

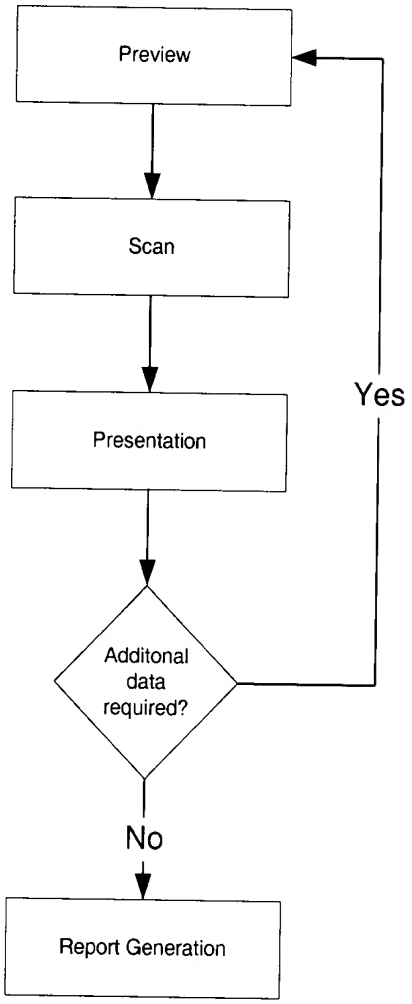


FIG. 42

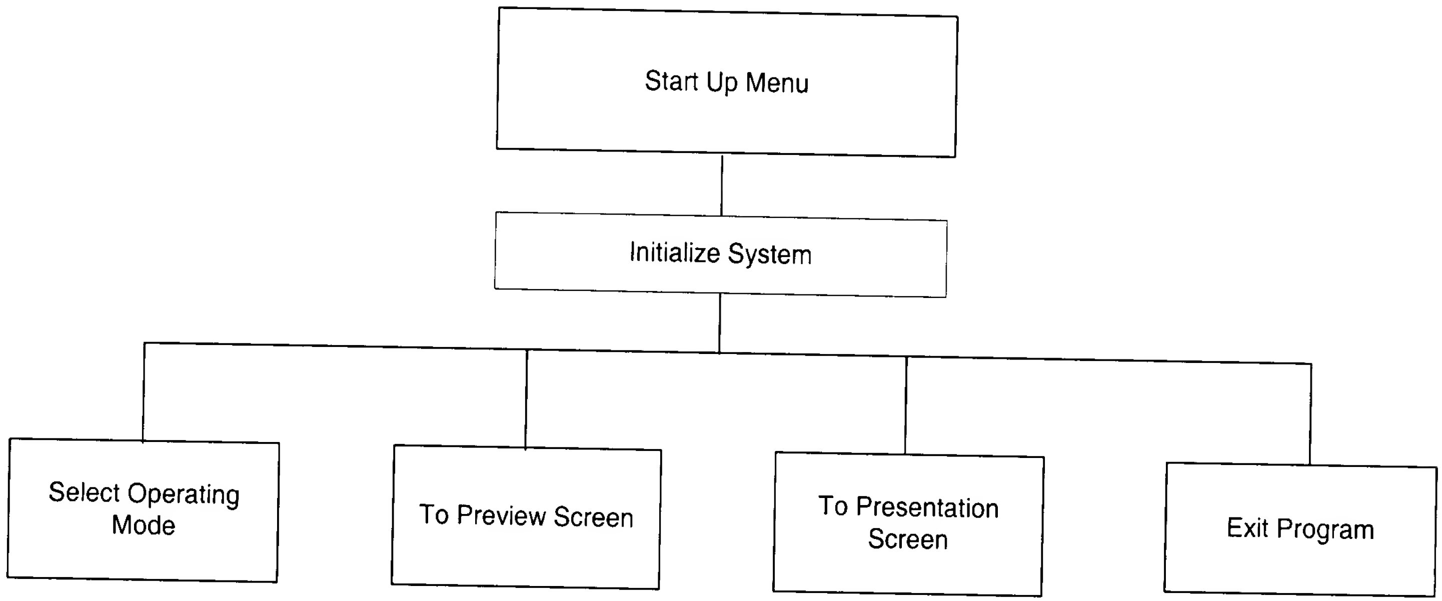

Start Up Menu
Initialize System
Select Operating Mode
To Preview Screen
To Presentation Screen
Exit Program

FIG. 43

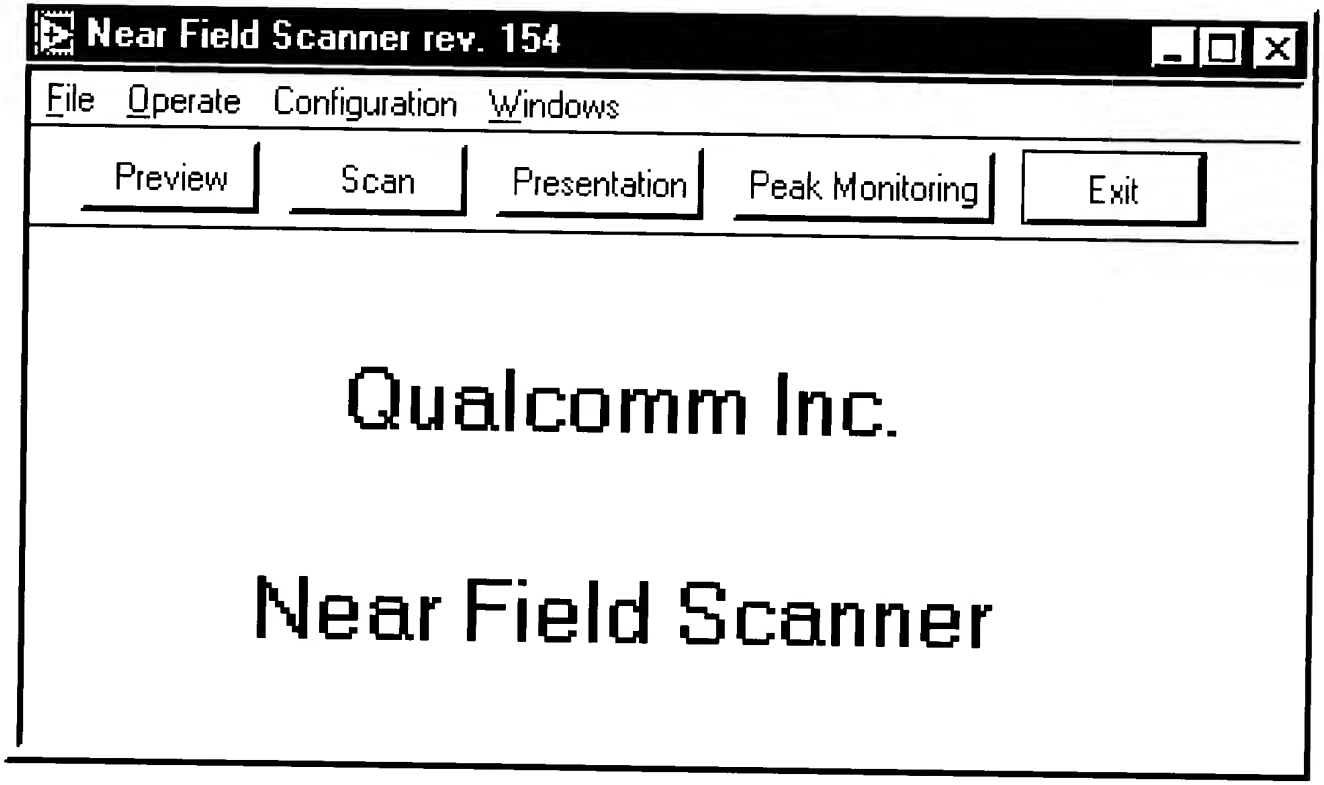


FIG. 44

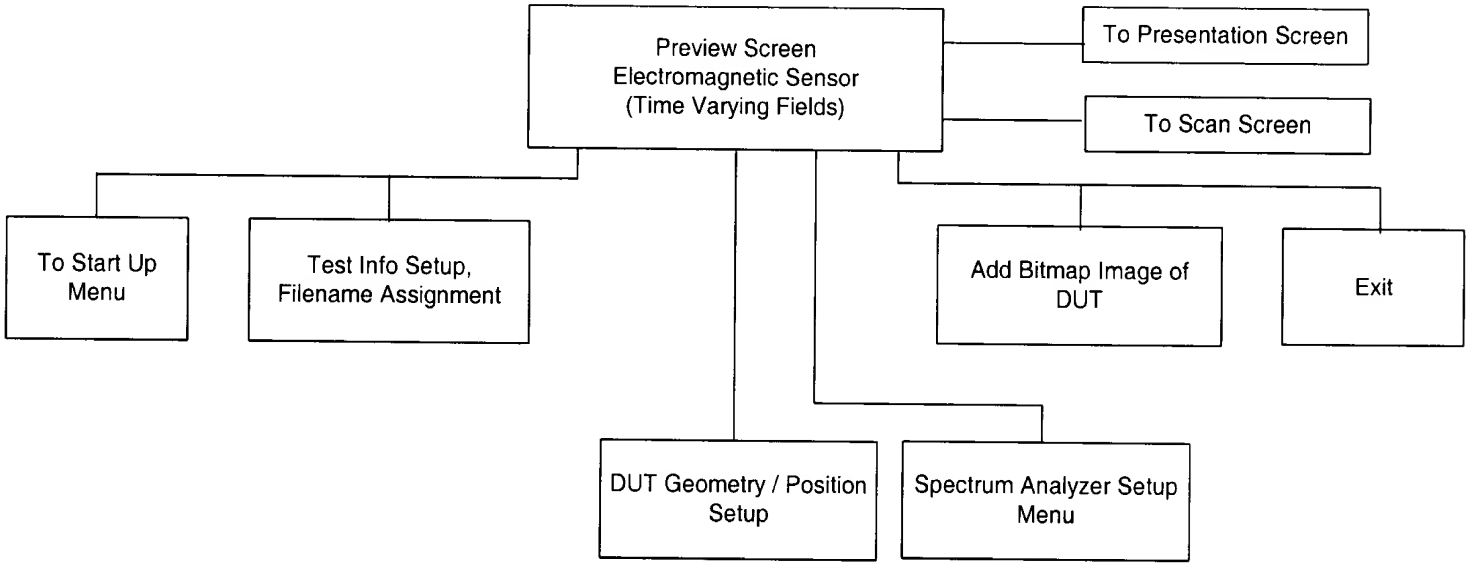


FIG. 45

FIG. 46

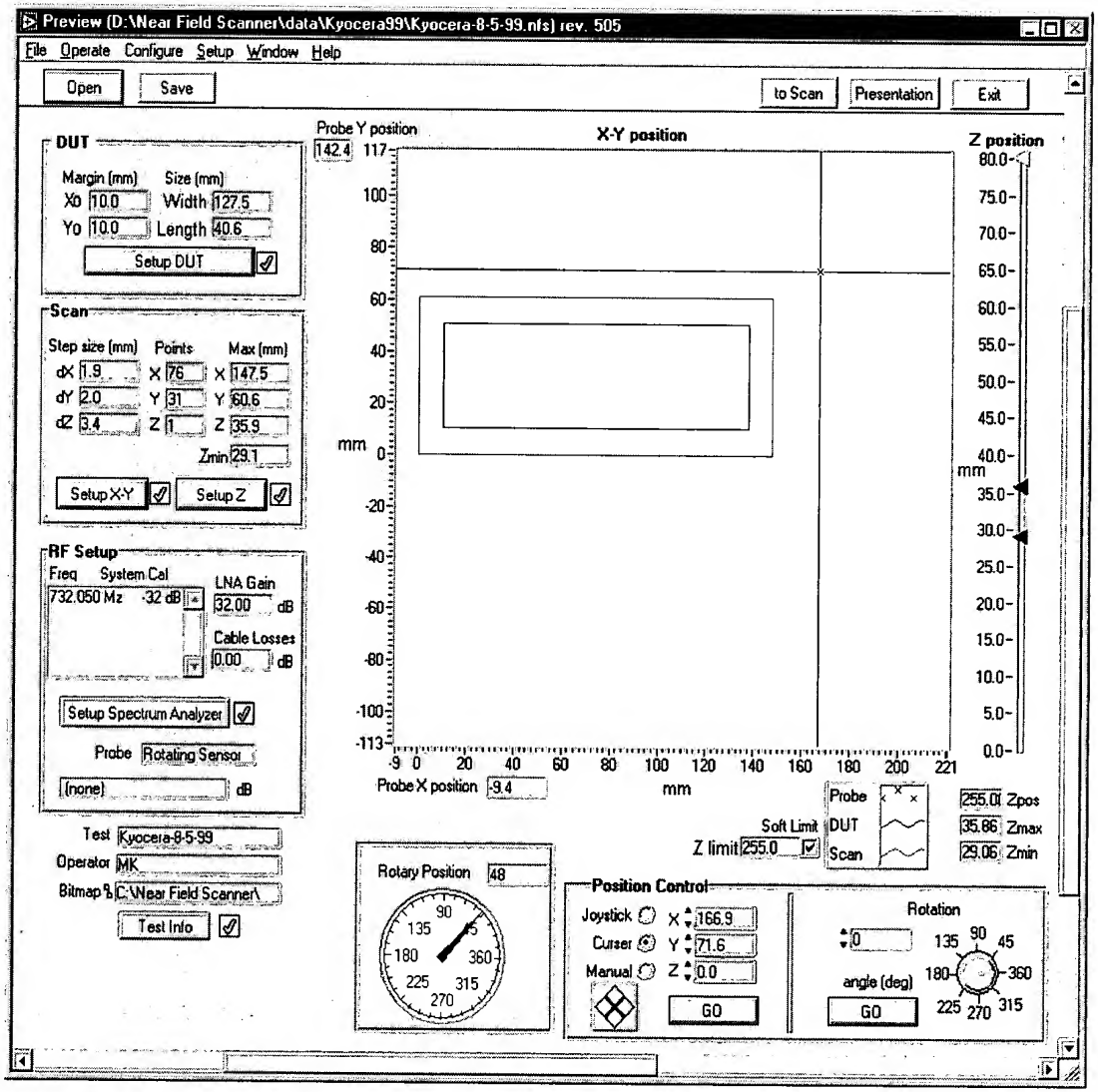
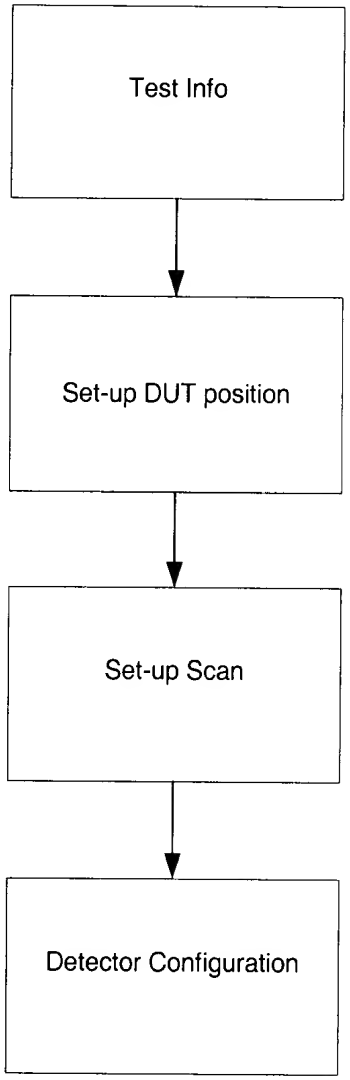

Preview (D:\Near Field Scanner\data\Kyocera99\Kyocera-8-5-99.nfs) rev. 505
File Operate Configure Setup Window Help
Open
Save
to Scan
Presentation
Exit
DUT
Margin (mm)
Size (mm)
Xo 10.0
Width 127.5
Yo 10.0
Length 40.6
Setup DUT
Scan
Step size (mm)
Points
Max (mm)
dX 1.9
X 76
X 147.5
dY 2.0
Y 31
Y 60.6
dZ 3.4
Z 1
Z 35.9
Zmin 29.1
Setup X-Y
Setup Z
RF Setup
Freq
System Cal
732.050 Mz
-32 dB
LNA Gain
32.00 dB
Cable Losses
0.00 dB
Setup Spectrum Analyzer
Probe
Rotating Sensor
(none)
dB
Test
Kyocera-8-5-99
Operator
MK
Bitmap
C:\Near Field Scanner\
Test Info
Probe Y position
142.4
X-Y position
Z position
mm
Probe X position
-9.4
Soft Limit
Z limit
255.0
Probe
DUT
Scan
255.0 Zpos
35.86 Zmax
29.06 Zmin
Rotary Position
48
Position Control
Joystick
Cursor
Manual
X
166.9
Y
71.6
Z
0.0
GO
Rotation
angle (deg)
GO

FIG. 47



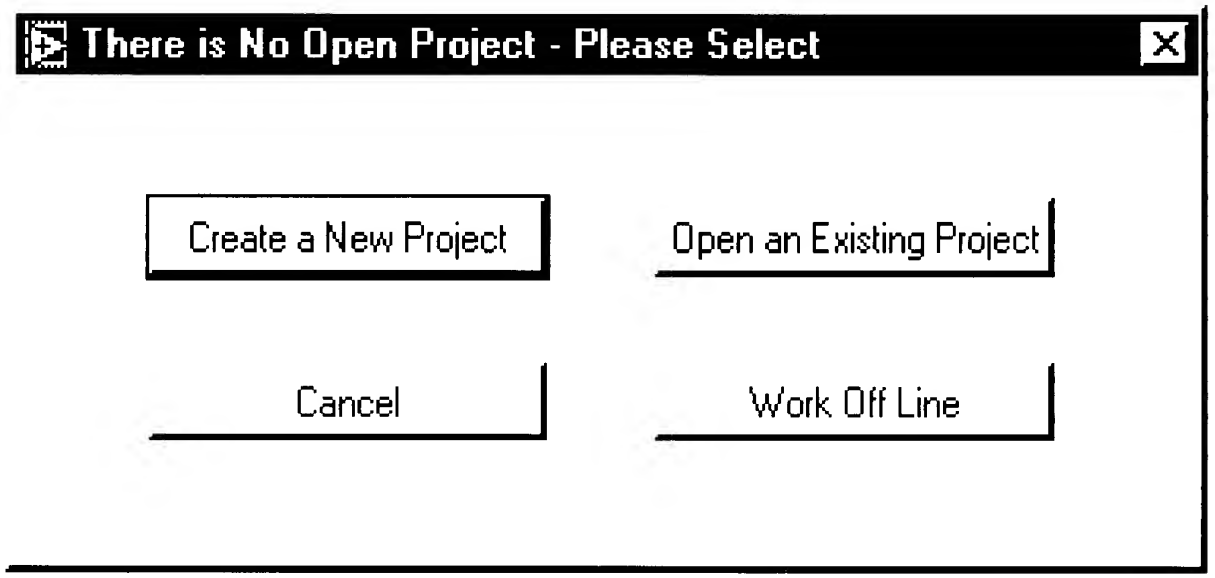


FIG. 48

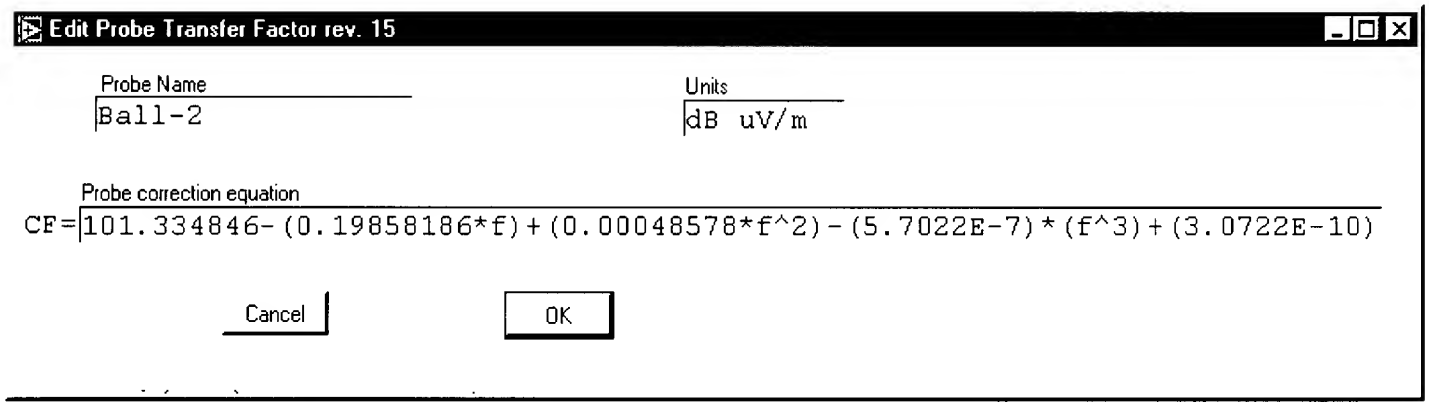
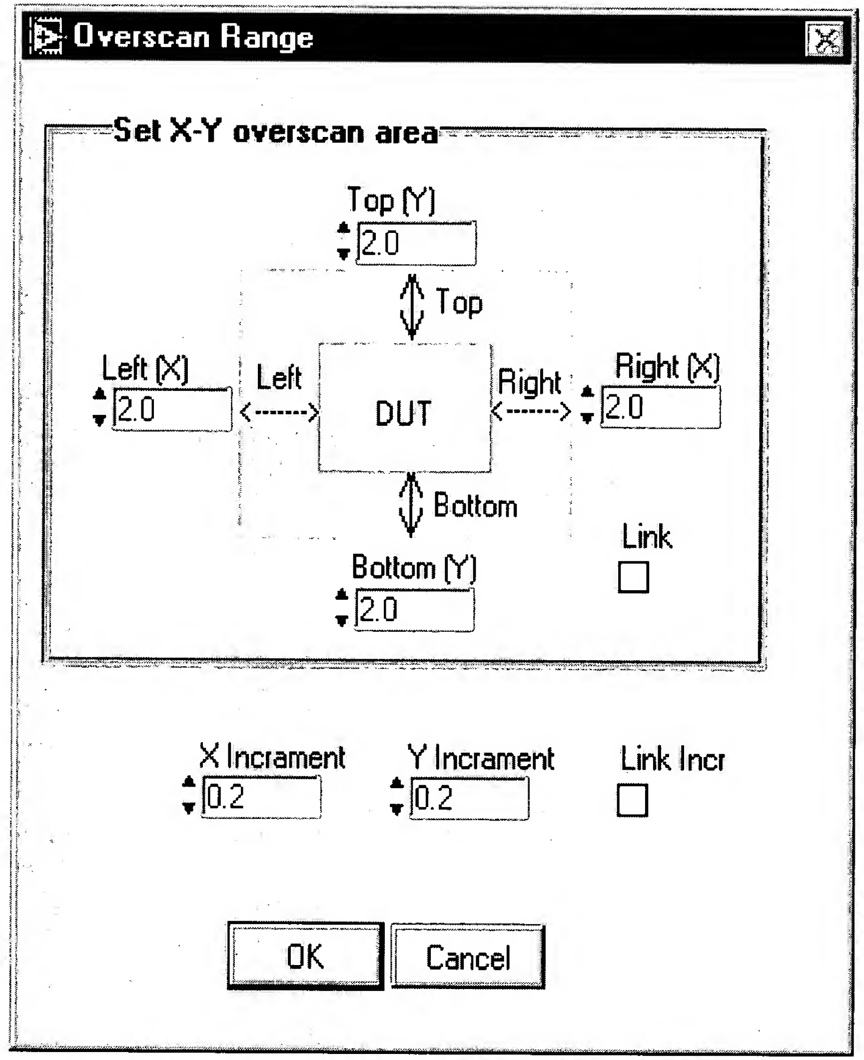

Edit Probe Transfer Factor rev. 15
Probe Name
Ball-2
Units
dB uV/m
Probe correction equation
CF=101.334846-(0.19858186*f)+(0.00048578*f^2)-(5.7022E-7)*(f^3)+(3.0722E-10)
Cancel
OK

FIG. 49

FIG. 50



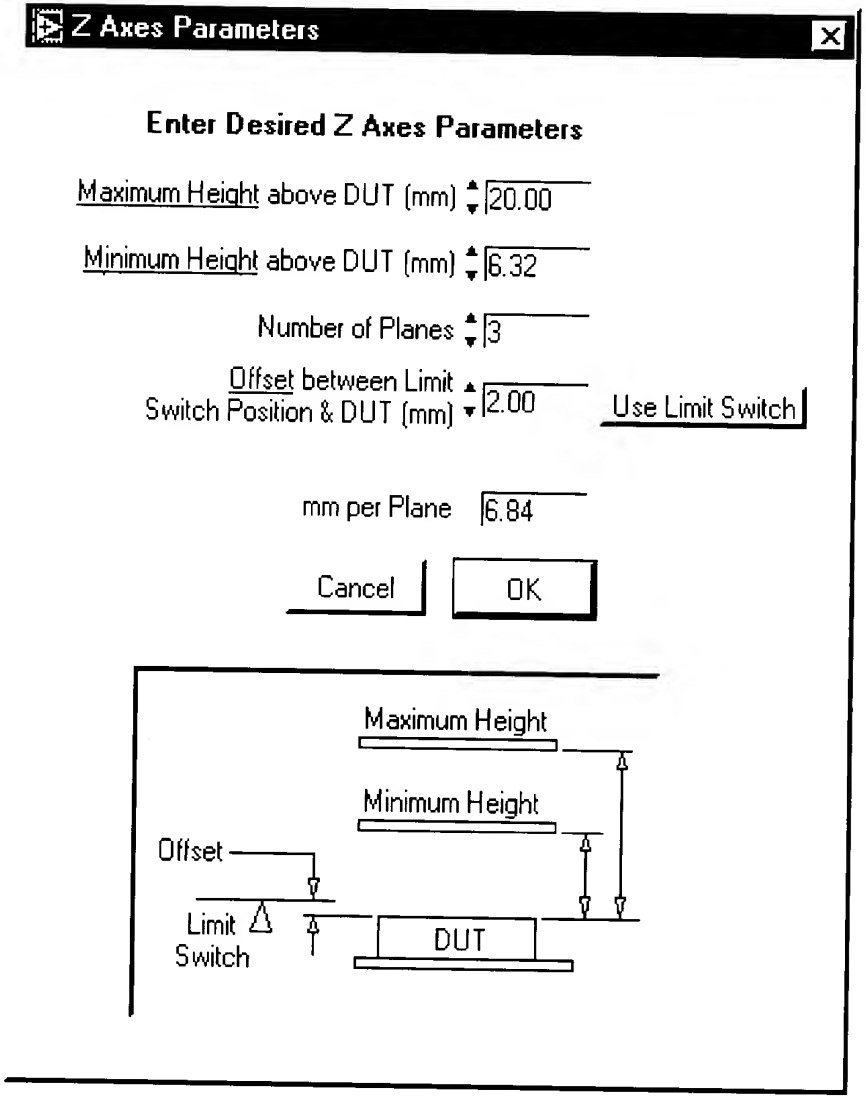


FIG. 51

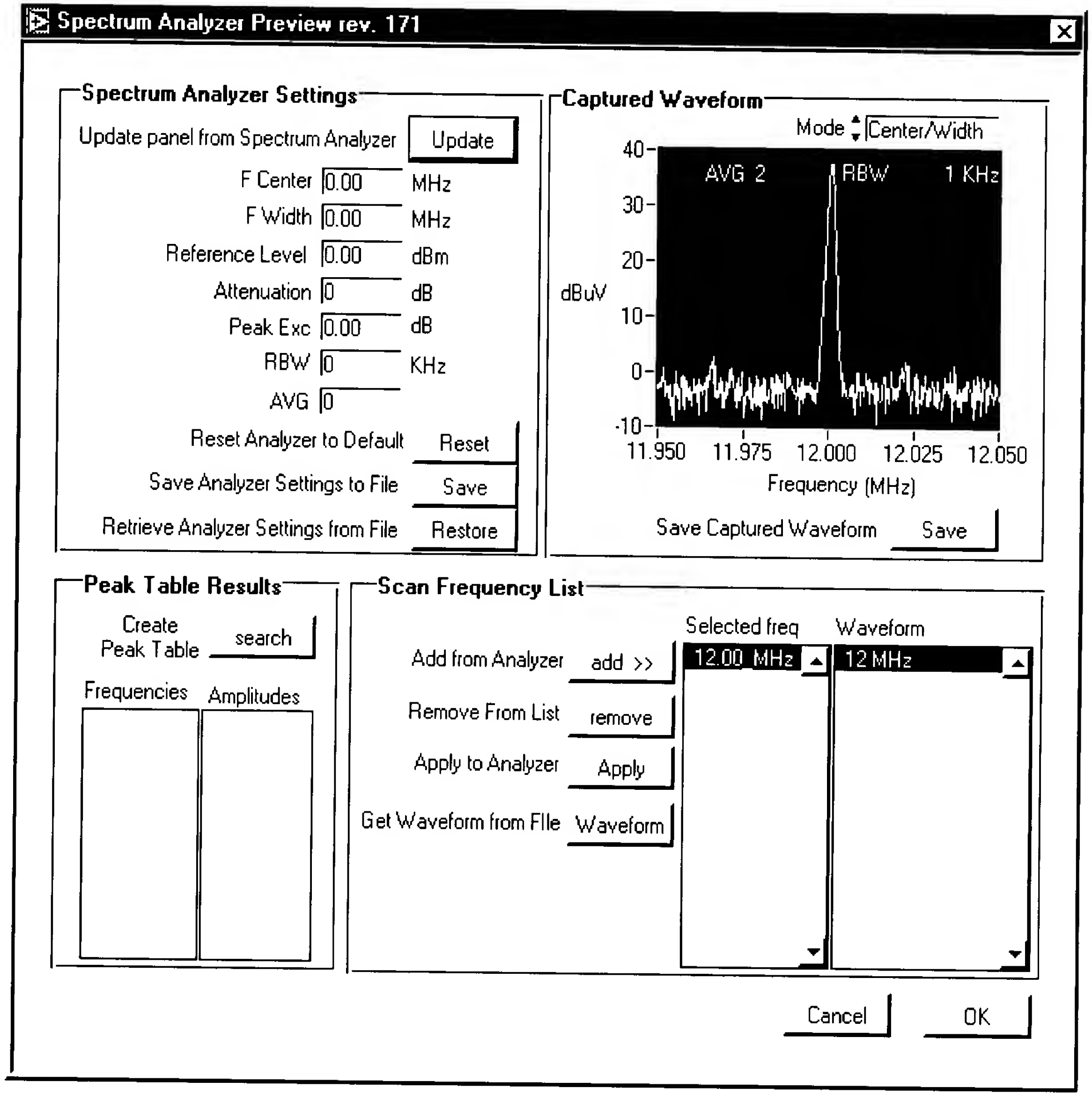
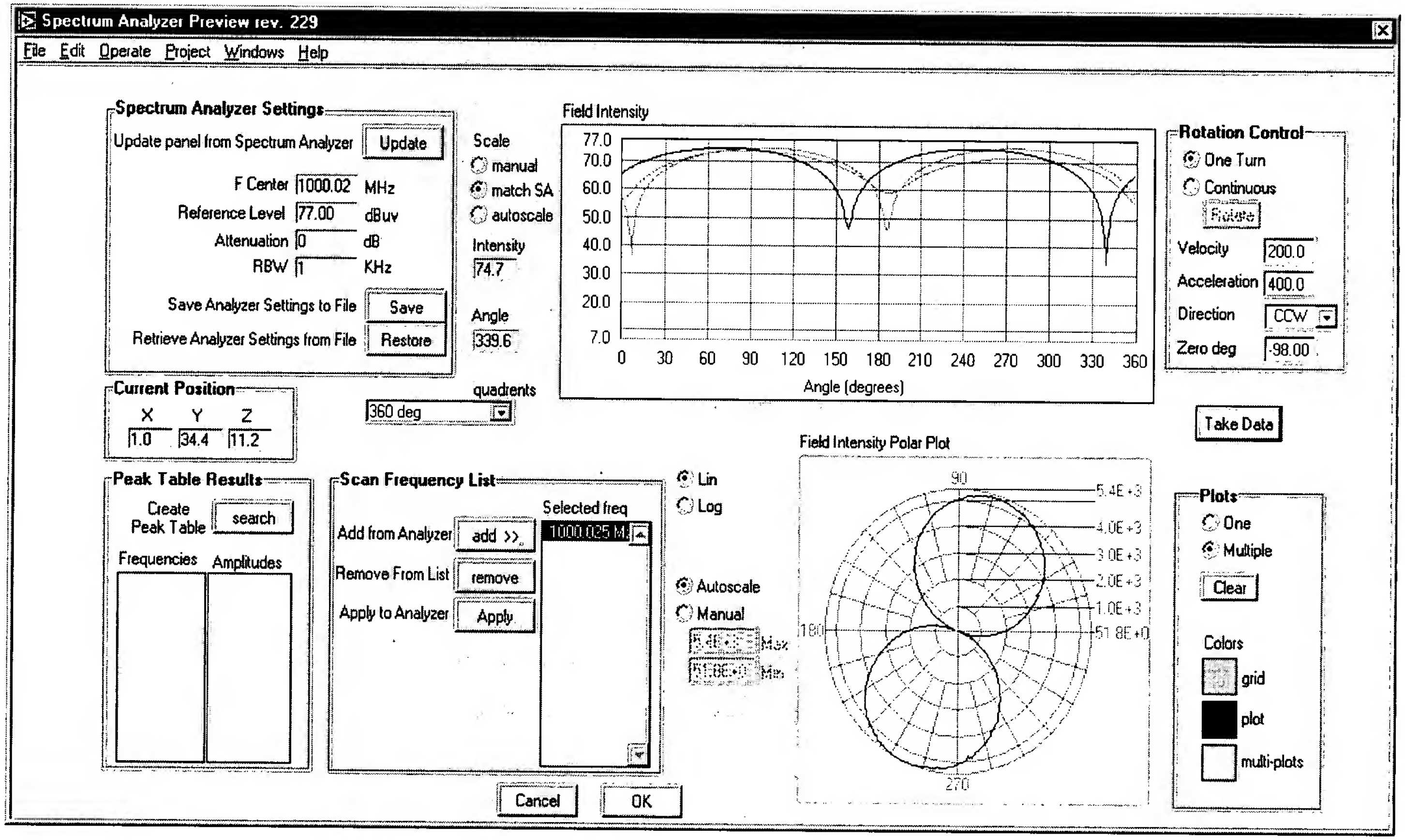

Spectrum Analyzer Preview rev. 171
Spectrum Analyzer Settings
Update panel from Spectrum Analyzer
Update
F Center
0.00
MHz
F Width
0.00
MHz
Reference Level
0.00
dBm
Attenuation
0
dB
Peak Exc
0.00
dB
RBW
0
KHz
AVG
0
Reset Analyzer to Default
Reset
Save Analyzer Settings to File
Save
Retrieve Analyzer Settings from File
Restore
Captured Waveform
Mode
Center/Width
AVG 2
RBW
1 KHz
dBuV
40
30
20
10
0
-10
11.950
11.975
12.000
12.025
12.050
Frequency (MHz)
Save Captured Waveform
Save
Peak Table Results
Create
Peak Table
search
Frequencies
Amplitudes
Scan Frequency List
Add from Analyzer
add >>
Remove From List
remove
Apply to Analyzer
Apply
Get Waveform from File
Waveform
Selected freq
12.00 MHz
Waveform
12 MHz
Cancel
OK

FIG. 52



Spectrum Analyzer Preview rev. 229
File Edit Operate Project Windows Help
Spectrum Analyzer Settings
Update panel from Spectrum Analyzer
Update
F Center 1000.02 MHz
Reference Level 77.00 dBuv
Attenuation 0 dB
RBW 1 KHz
Save Analyzer Settings to File
Save
Retrieve Analyzer Settings from File
Restore
Scale
manual
match SA
autoscale
Intensity
74.7
Angle
339.6
Field Intensity
77.0
70.0
60.0
50.0
40.0
30.0
20.0
7.0
0 30 60 90 120 150 180 210 240 270 300 330 360
Angle (degrees)
Rotation Control
One Turn
Continuous
Velocity 200.0
Acceleration 400.0
Direction CCW
Zero deg -98.00
Current Position
X Y Z
1.0 34.4 11.2
quadrents
360 deg
Take Data
Field Intensity Polar Plot
Peak Table Results
Create Peak Table
search
Frequencies
Amplitudes
Scan Frequency List
Add from Analyzer
add >>
Remove From List
remove
Apply to Analyzer
Apply
Selected freq
Lin
Log
Autoscale
Manual
Max
Min
90
180
270
5.4E+3
4.0E+3
3.0E+3
2.0E+3
1.0E+3
Plots
One
Multiple
Clear
Colors
grid
plot
multi-plots
Cancel
OK

FIG. 53

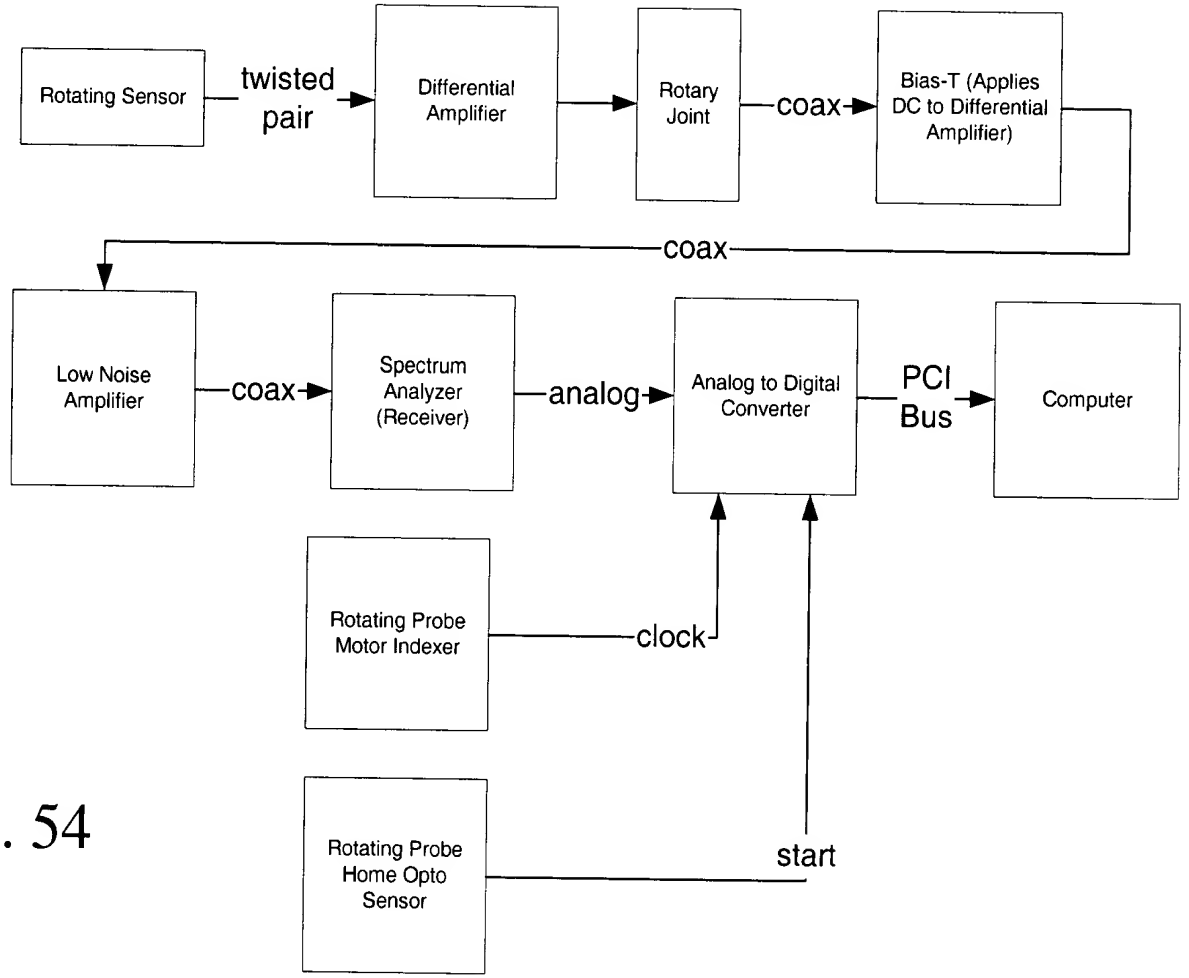


FIG. 54

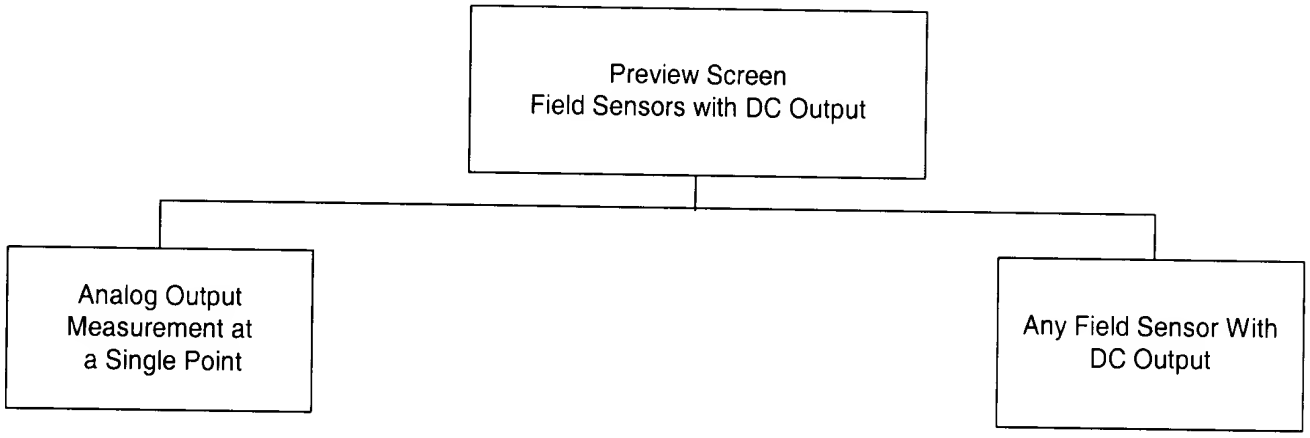


FIG. 55

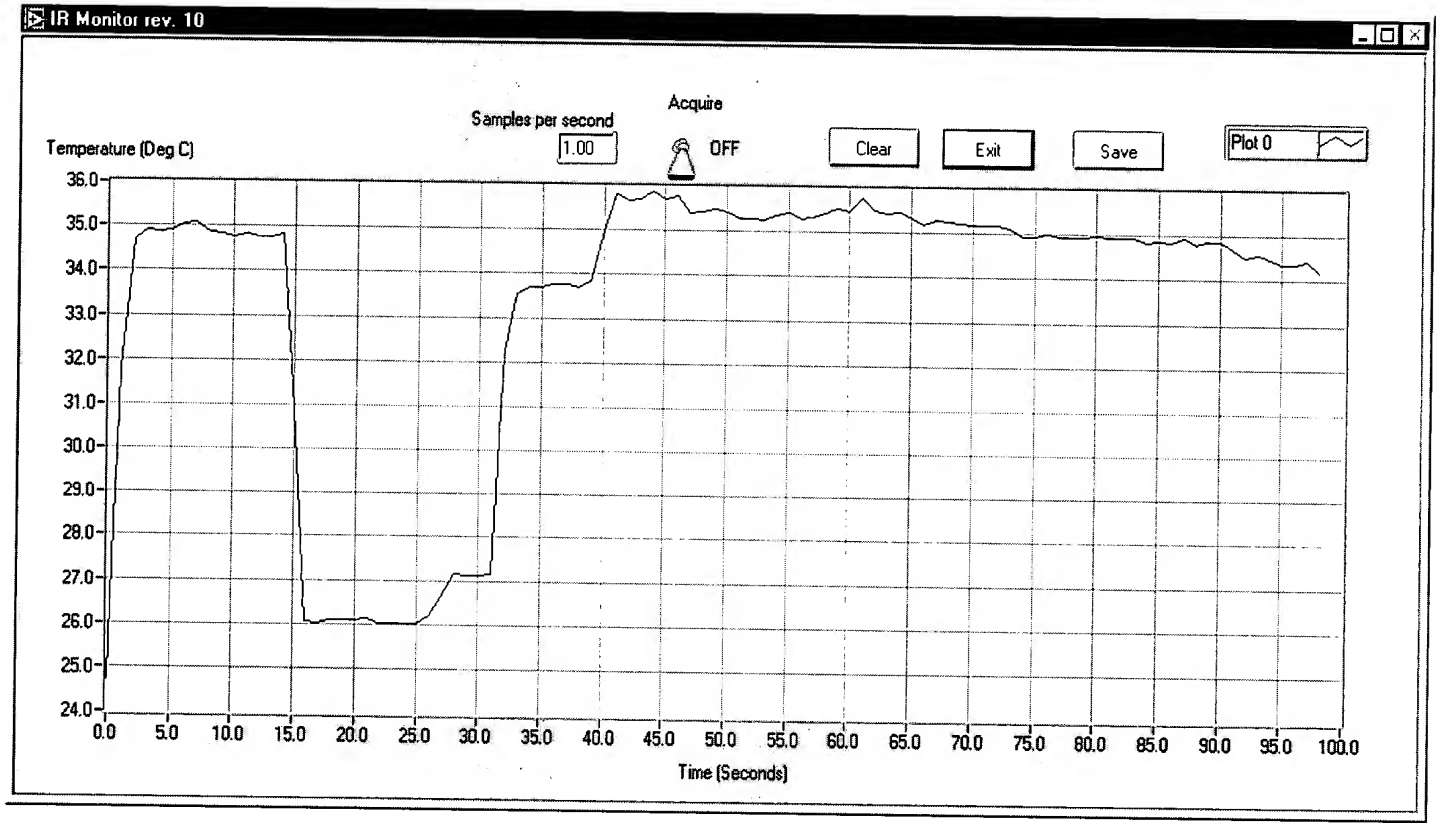
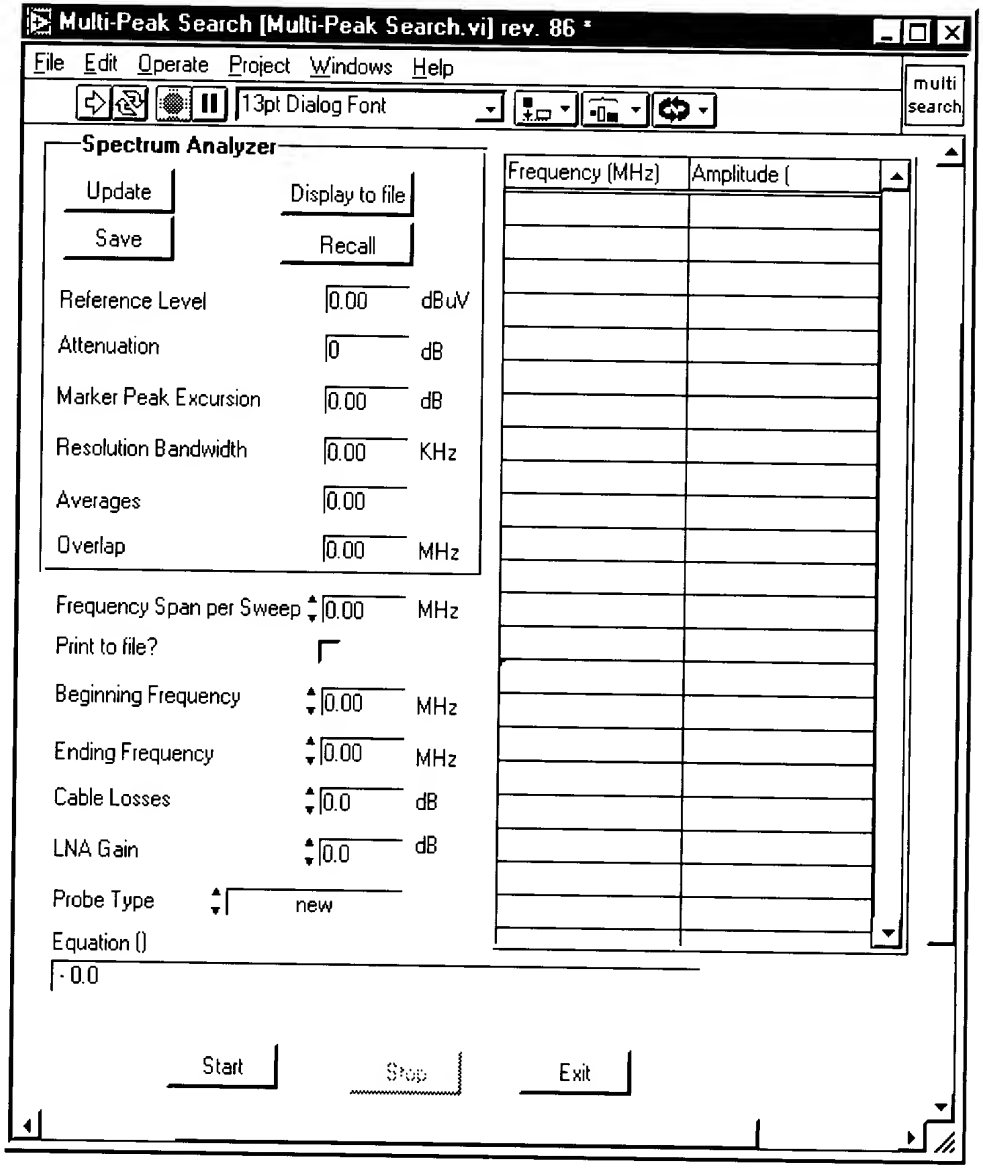

IR Monitor rev. 10
Acquire
Samples per second
1.00
OFF
Clear
Exit
Save
Plot 0
Temperature (Deg C)
36.0
35.0
34.0
33.0
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0
Time (Seconds)

FIG. 56

FIG. 57


Multi-Peak Search [Multi-Peak Search.vi] rev. 86 *
File Edit Operate Project Windows Help
13pt Dialog Font
multi search
Spectrum Analyzer
Update
Display to file
Save
Recall
Reference Level
0.00
dBuV
Attenuation
0
dB
Marker Peak Excursion
0.00
dB
Resolution Bandwidth
0.00
KHz
Averages
0.00
Overlap
0.00
MHz
Frequency Span per Sweep
0.00
MHz
Print to file?
Beginning Frequency
0.00
MHz
Ending Frequency
0.00
MHz
Cable Losses
0.0
dB
LNA Gain
0.0
dB
Probe Type
new
Equation ()
0.0
Frequency (MHz)
Amplitude (
Start
Stop
Exit

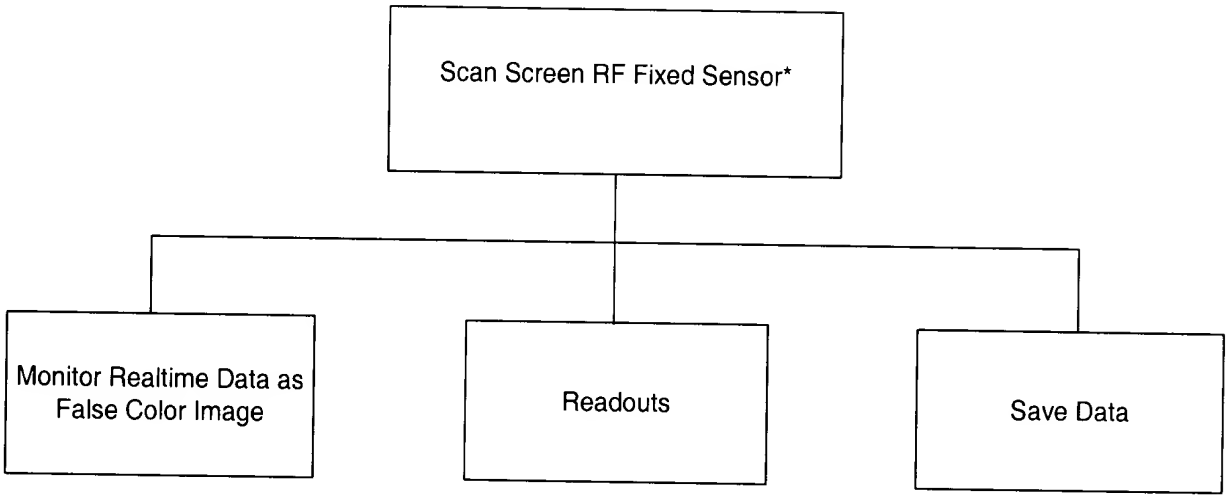


FIG. 58

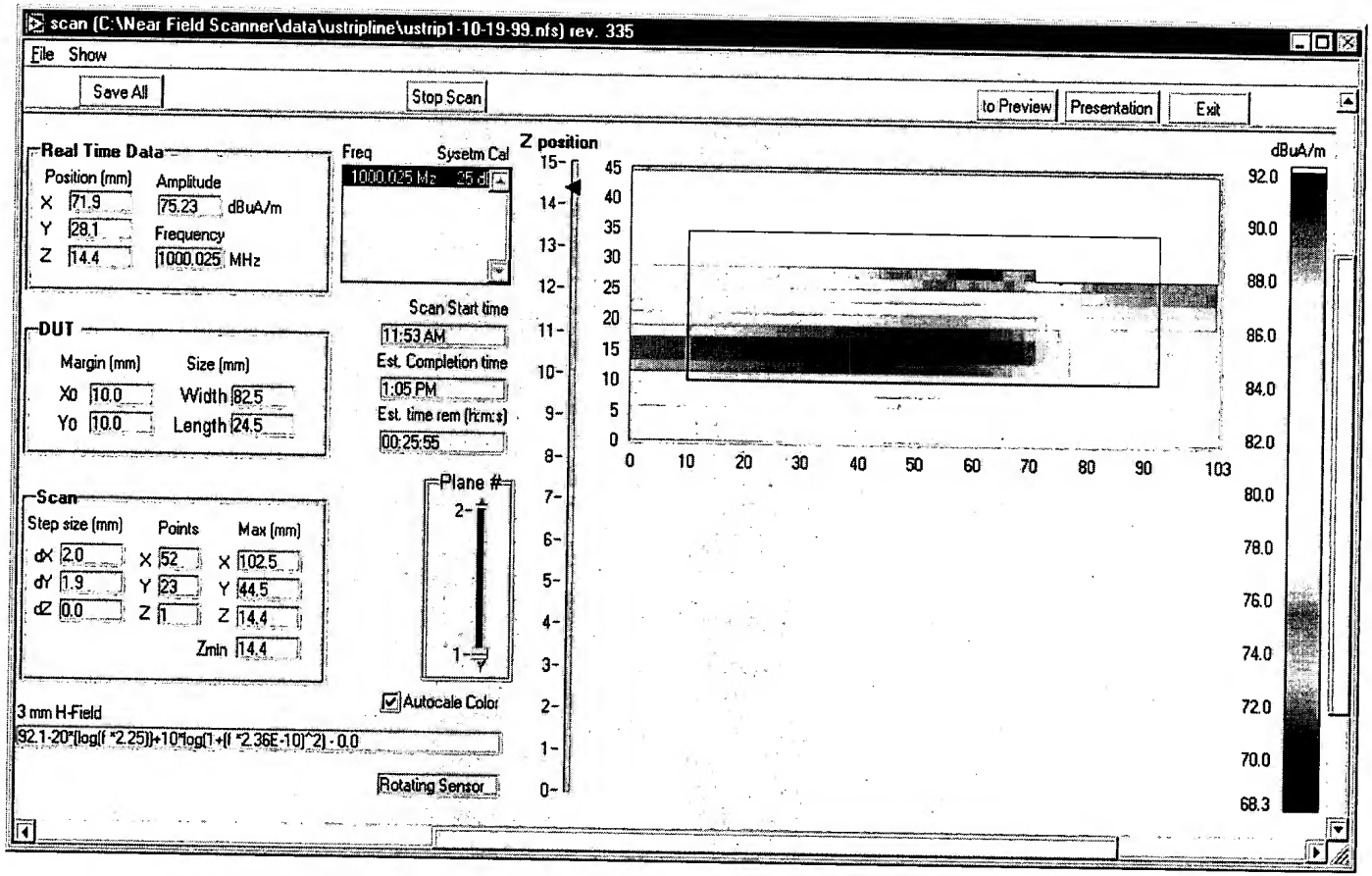
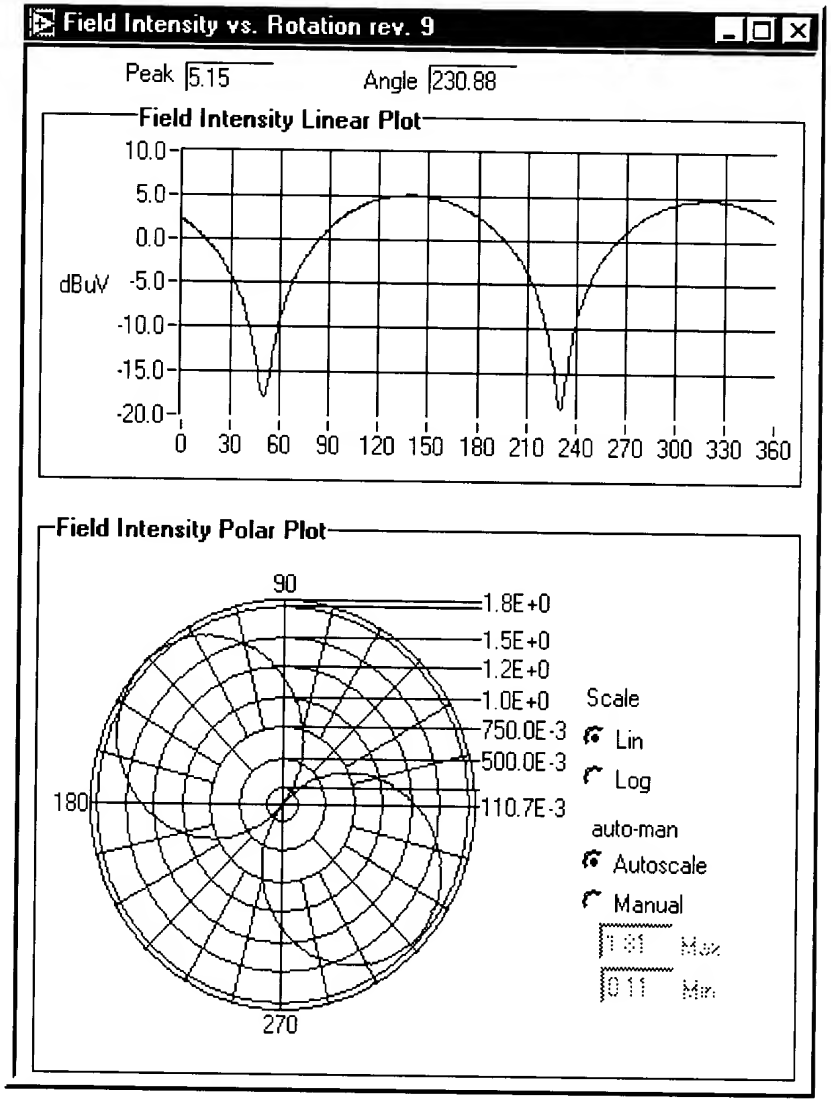


FIG. 59

FIG. 60



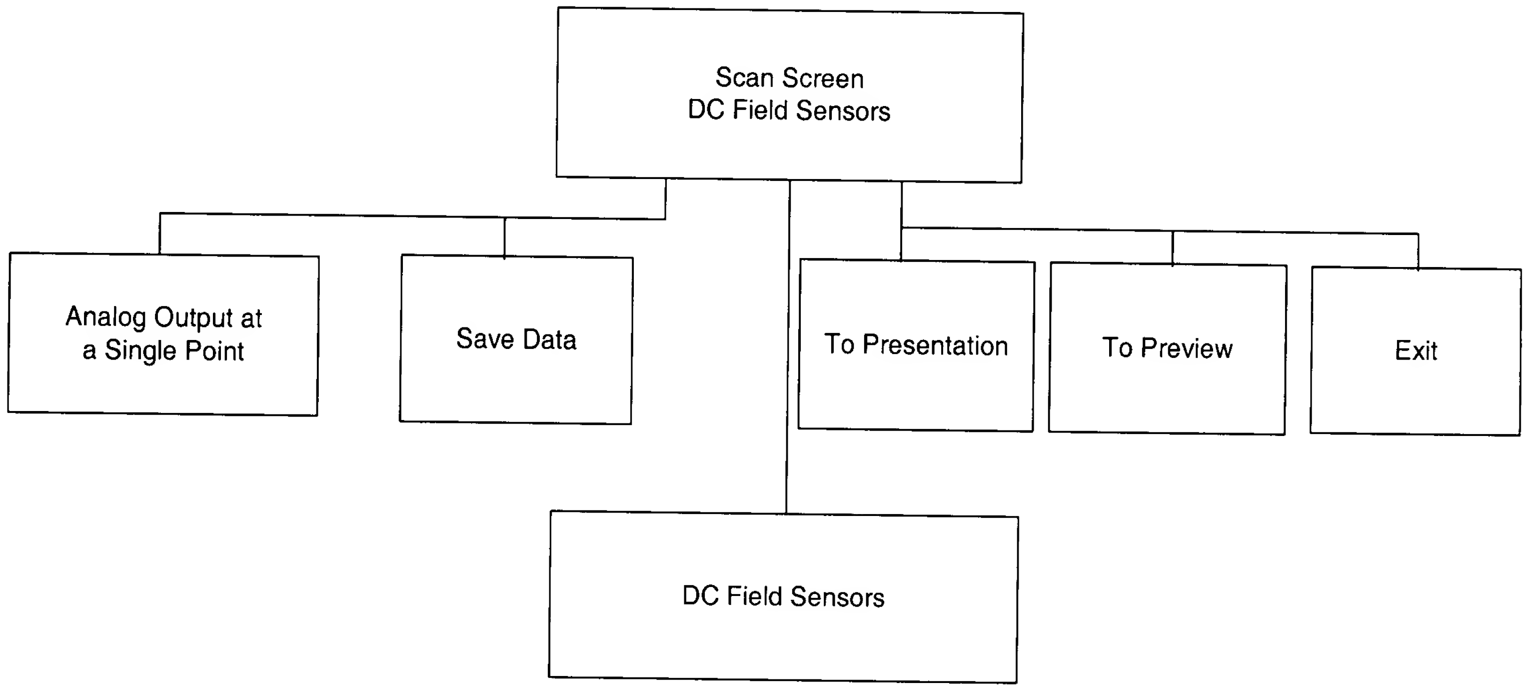

Scan Screen
DC Field Sensors
Analog Output at
a Single Point
Save Data
To Presentation
To Preview
Exit
DC Field Sensors

FIG. 61

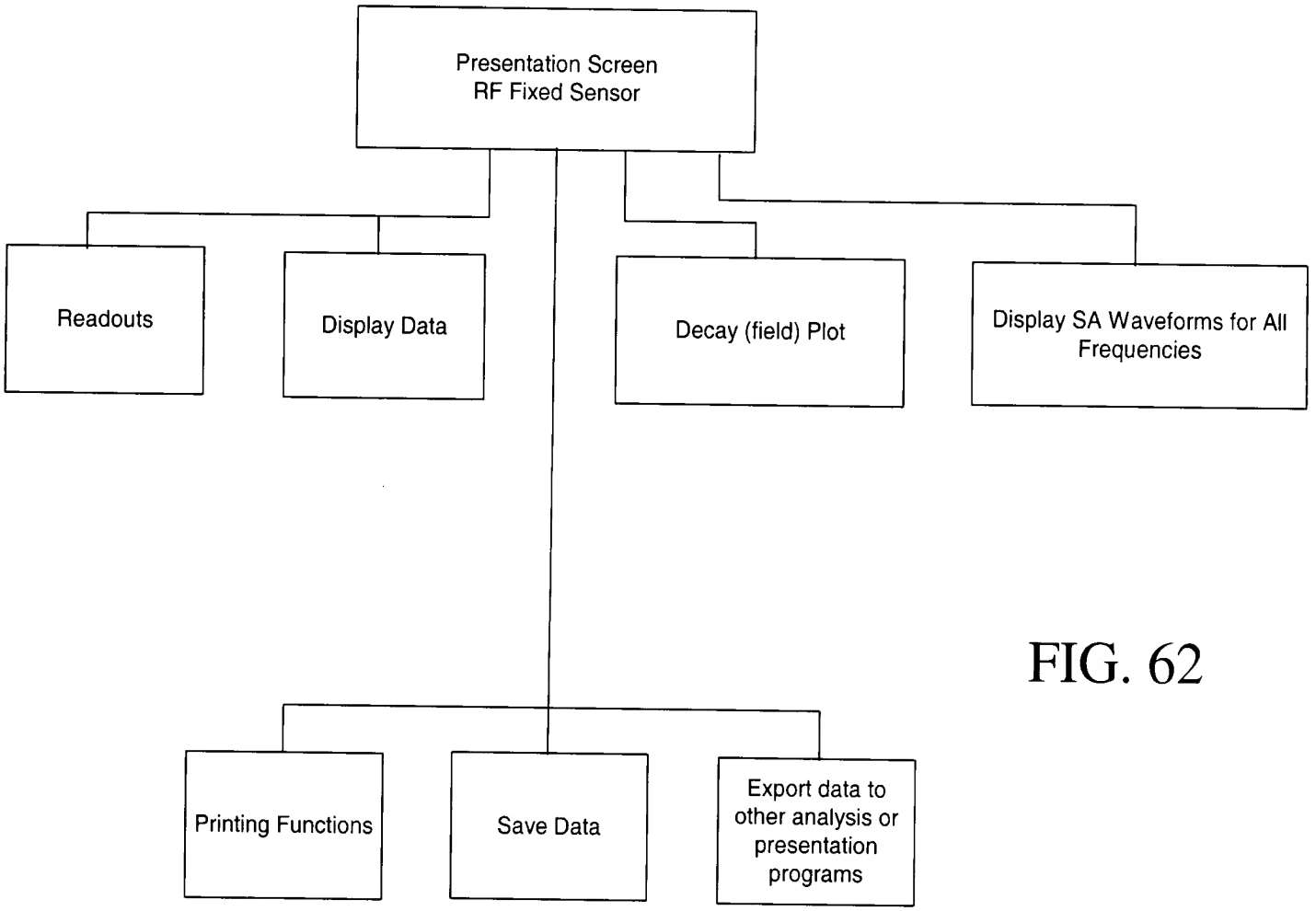


FIG. 62

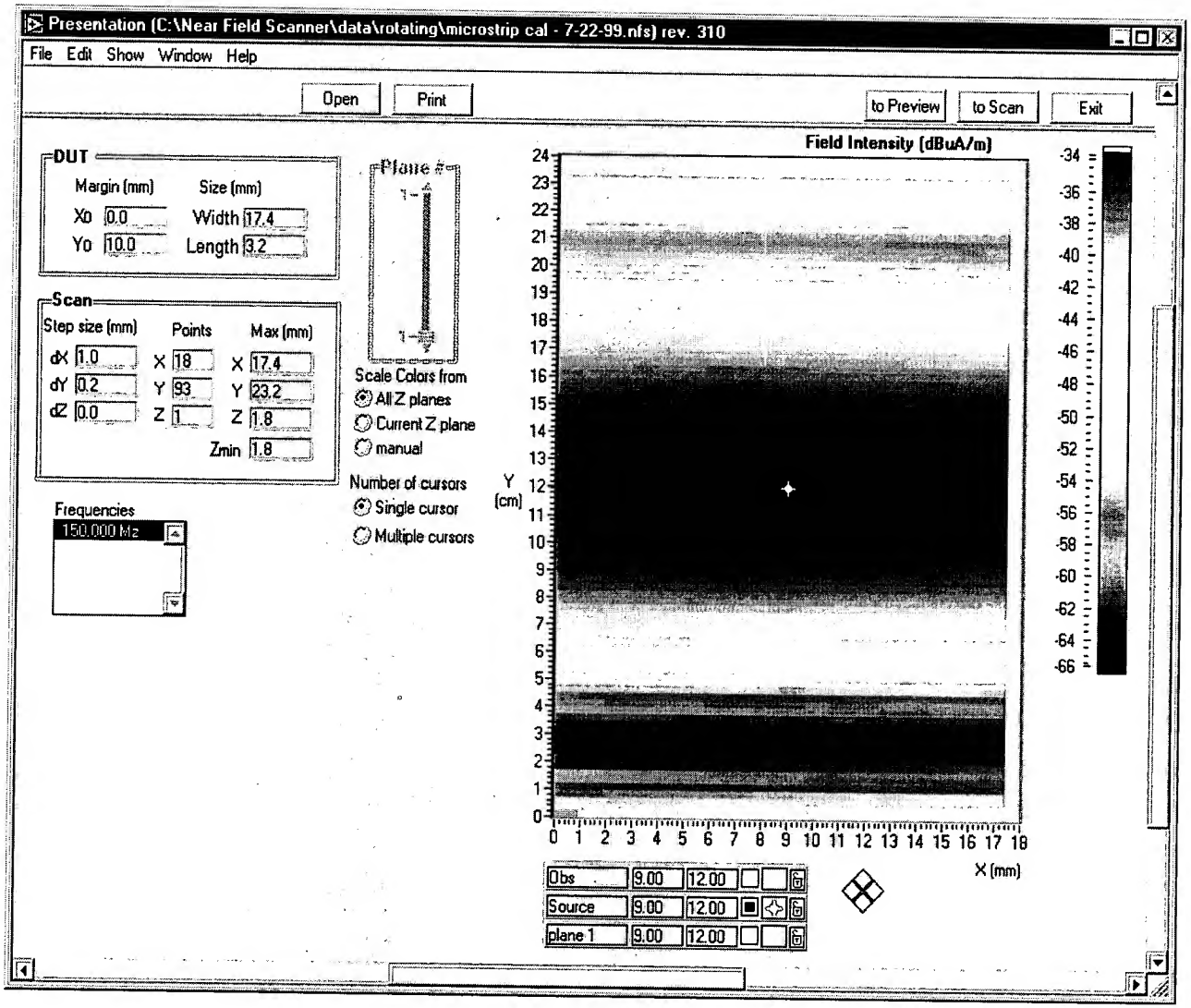
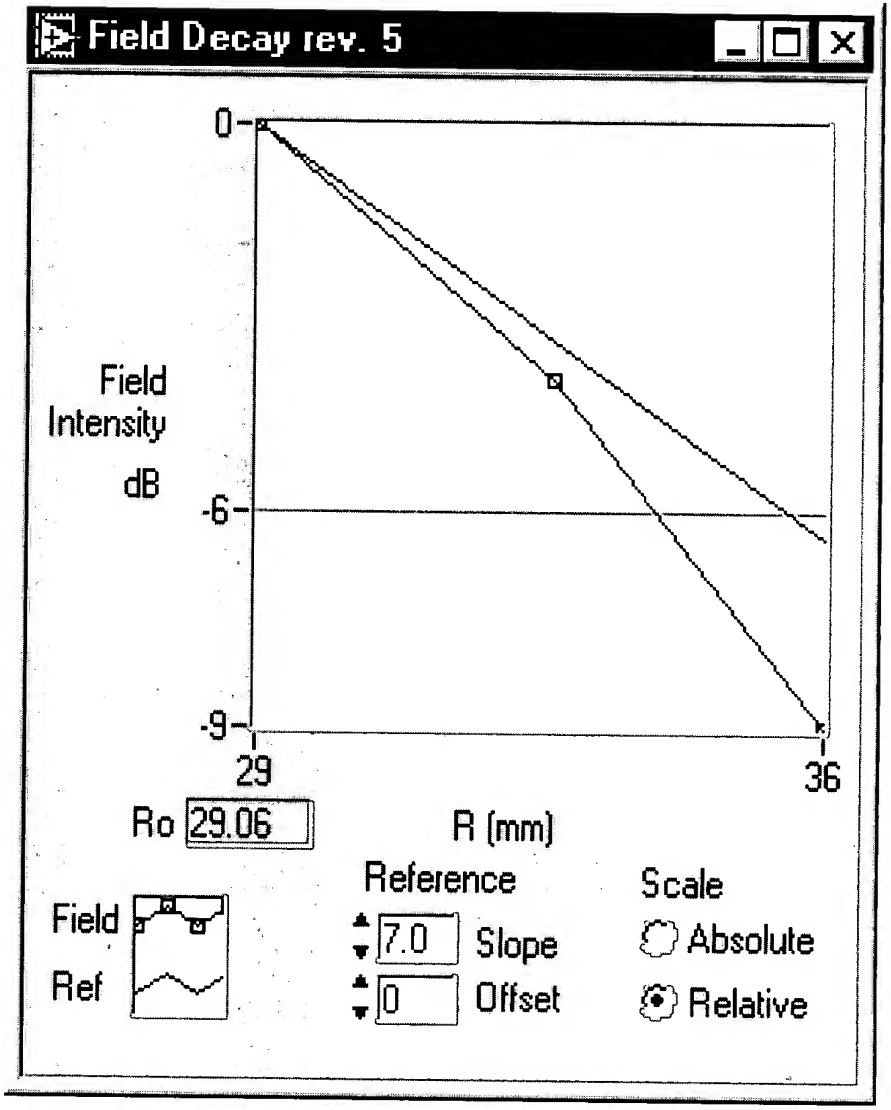

Presentation (C:\Near Field Scanner\data\rotating\microstrip cal - 7-22-99.nfs) rev. 310
File Edit Show Window Help
Open
Print
to Preview
to Scan
Exit
DUT
Margin (mm)
Size (mm)
Xo 0.0
Yo 10.0
Width 17.4
Length 3.2
Scan
Step size (mm)
Points
Max (mm)
dX 1.0
dY 0.2
dZ 0.0
X 18
Y 93
Z 1
X 17.4
Y 23.2
Z 1.8
Zmin 1.8
Frequencies
150.000 Mz
Plane #
Scale Colors from
All Z planes
Current Z plane
manual
Number of cursors
Single cursor
Multiple cursors
Field Intensity (dBuA/m)
Y (cm)
X (mm)
Obs 9.00 12.00
Source 9.00 12.00
plane 1 9.00 12.00

FIG. 63

FIG. 64



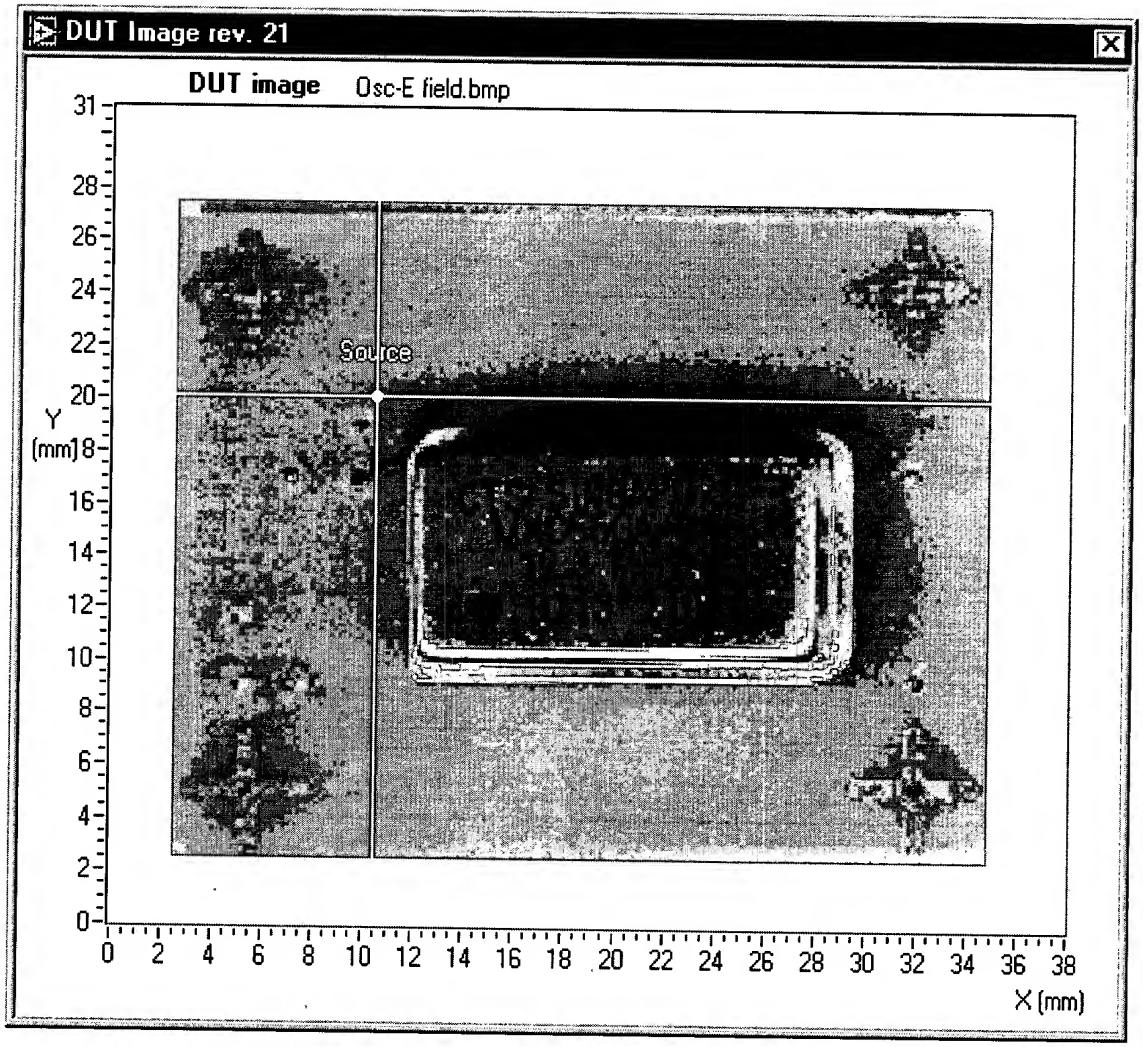
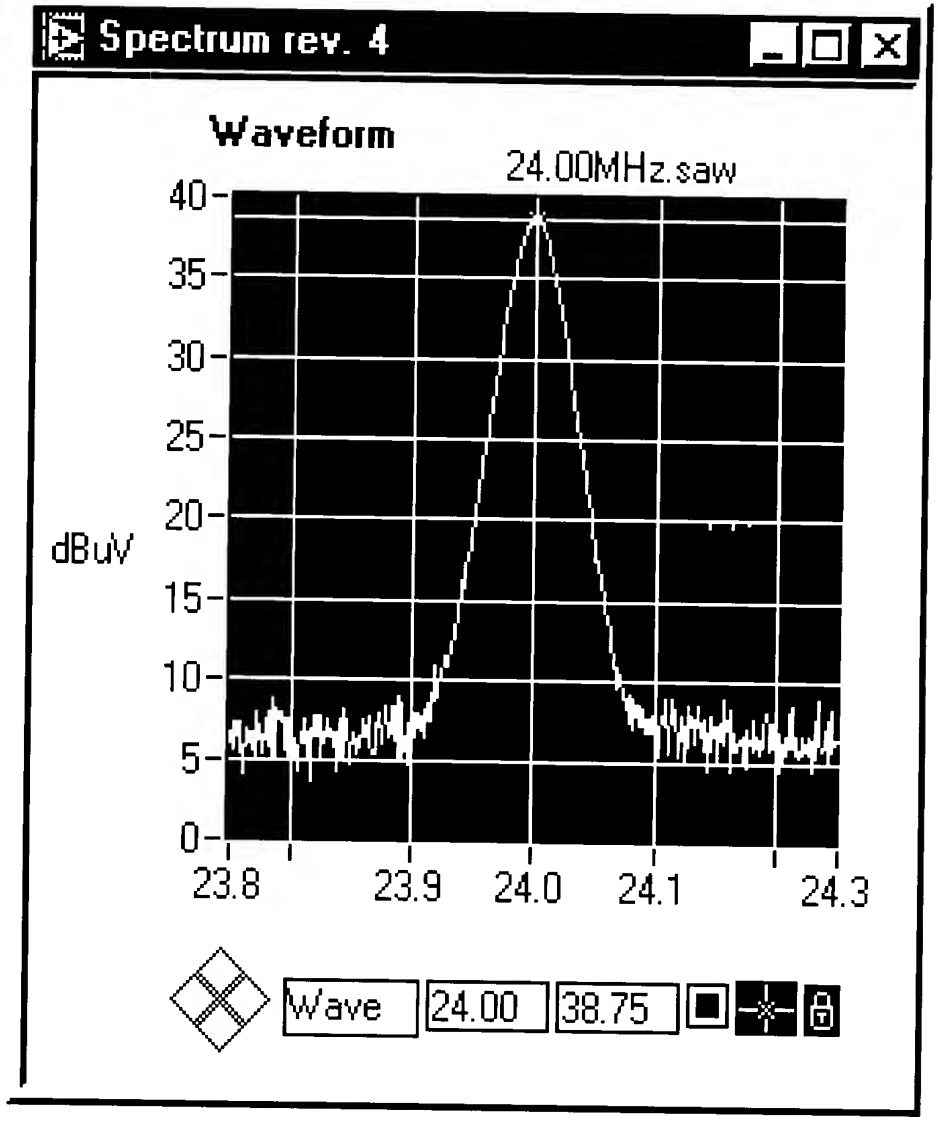


FIG. 65

FIG. 66



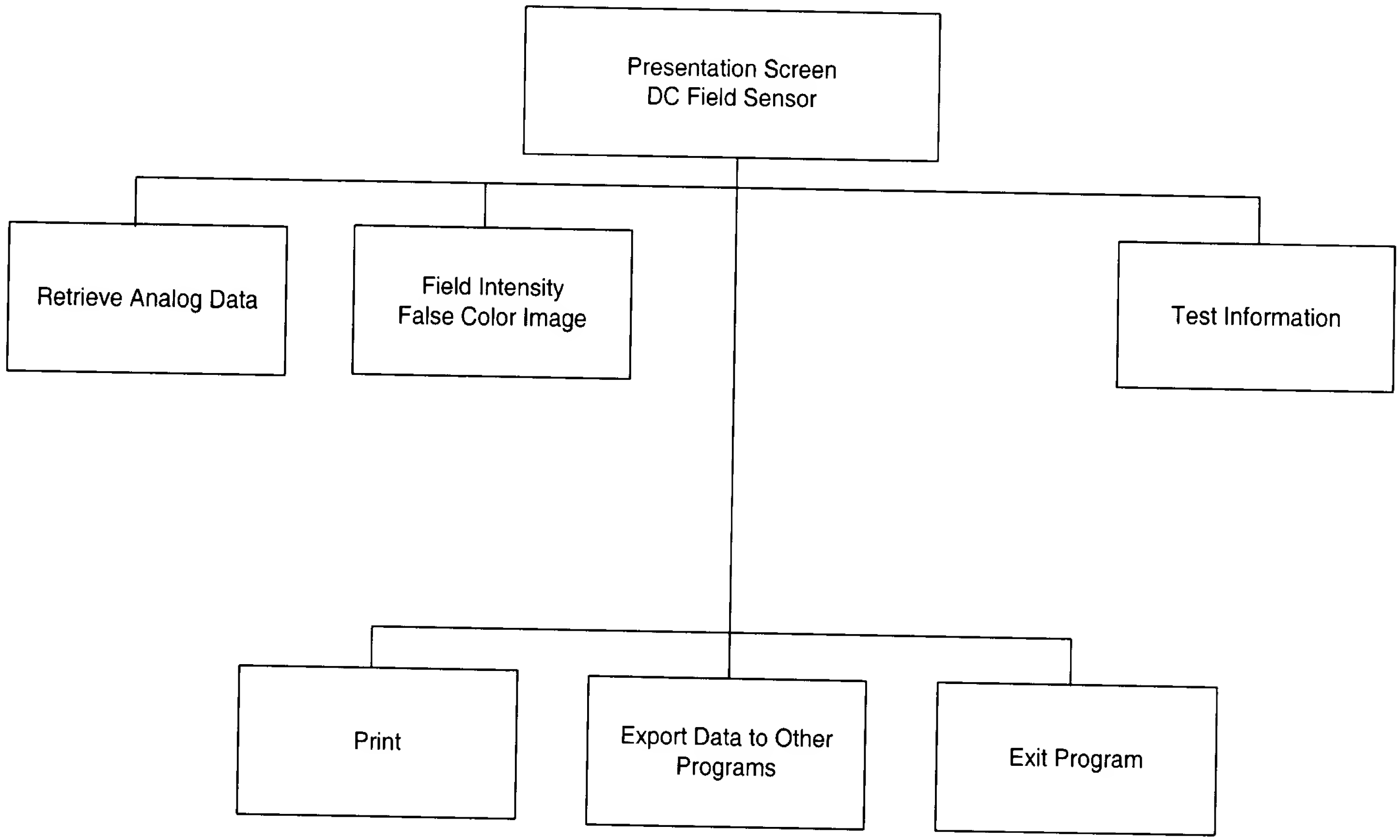

Presentation Screen
DC Field Sensor
Retrieve Analog Data
Field Intensity
False Color Image
Test Information
Print
Export Data to Other
Programs
Exit Program

FIG. 67

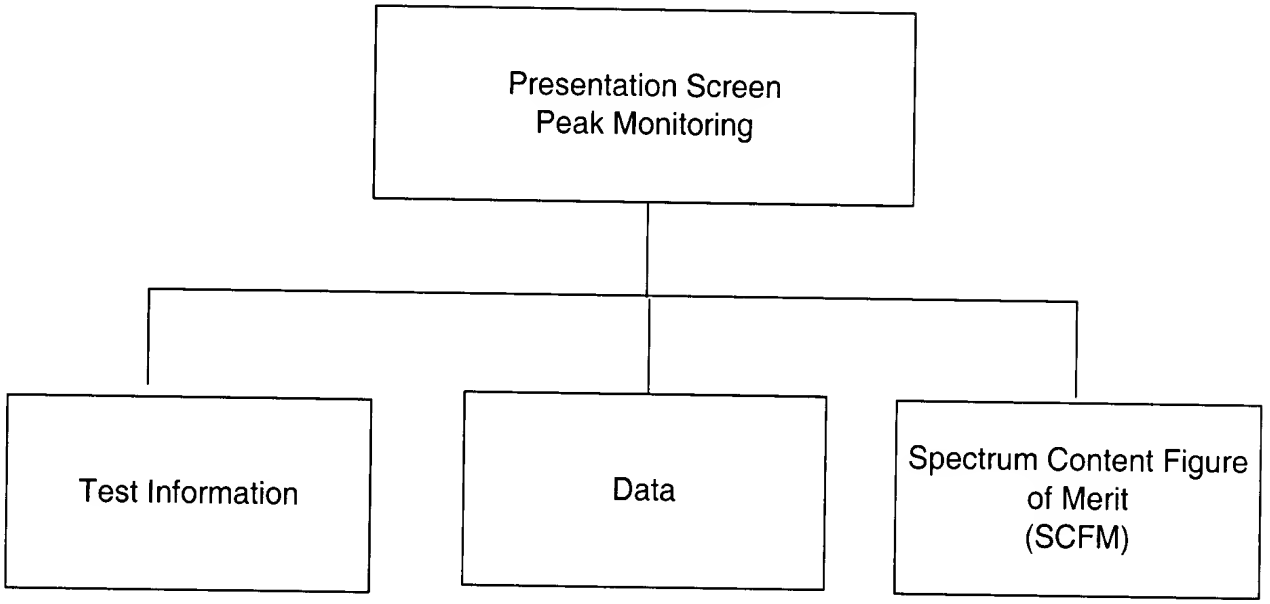


FIG. 68

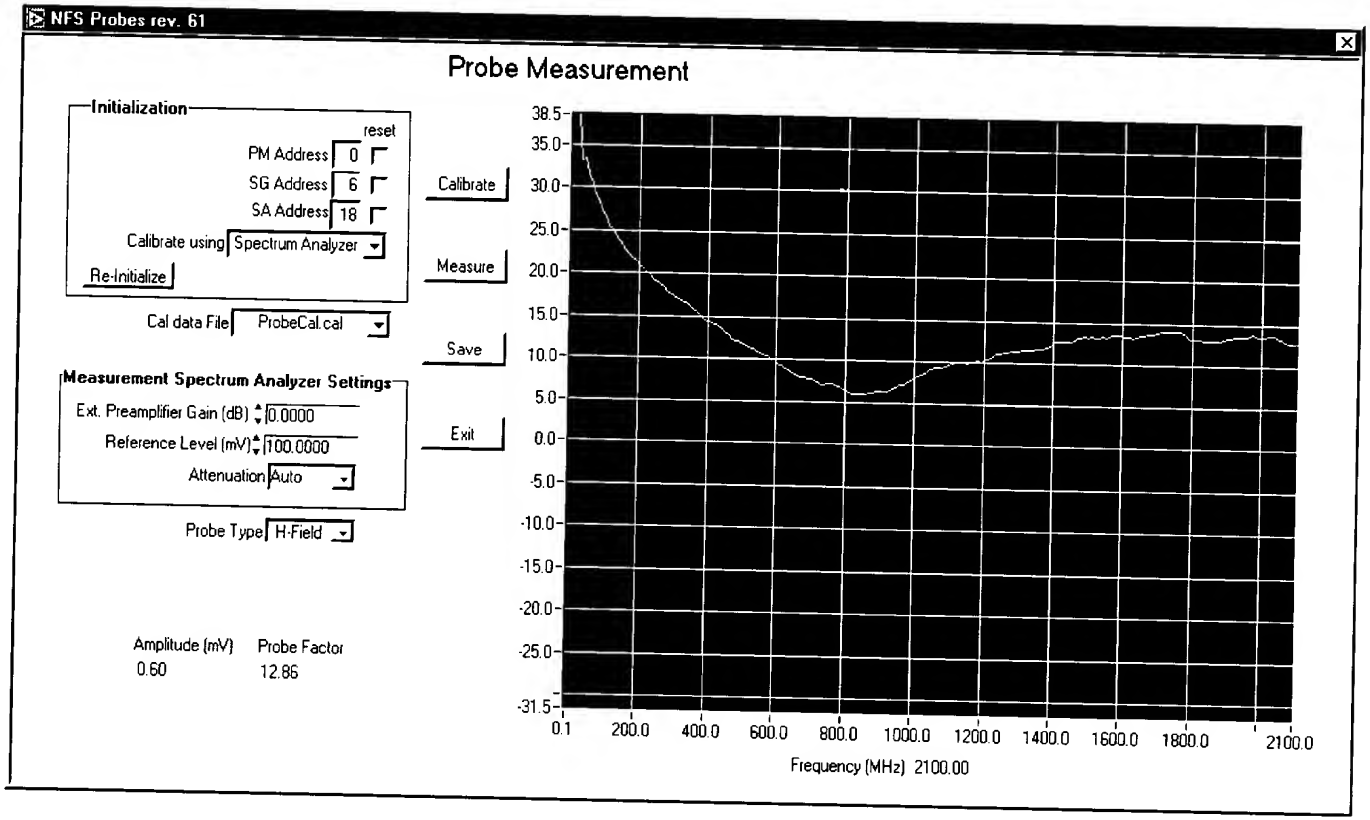

NFS Probes rev. 61
Probe Measurement
Initialization
reset
PM Address 0
SG Address 6
SA Address 18
Calibrate using Spectrum Analyzer
Re-Initialize
Cal data File ProbeCal.cal
Measurement Spectrum Analyzer Settings
Ext. Preamplifier Gain (dB) 0.0000
Reference Level (mV) 100.0000
Attenuation Auto
Probe Type H-Field
Amplitude (mV) 0.60
Probe Factor 12.86
Calibrate
Measure
Save
Exit
38.5
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-31.5
0.1
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
1600.0
1800.0
2100.0
Frequency (MHz) 2100.00

FIG. 69

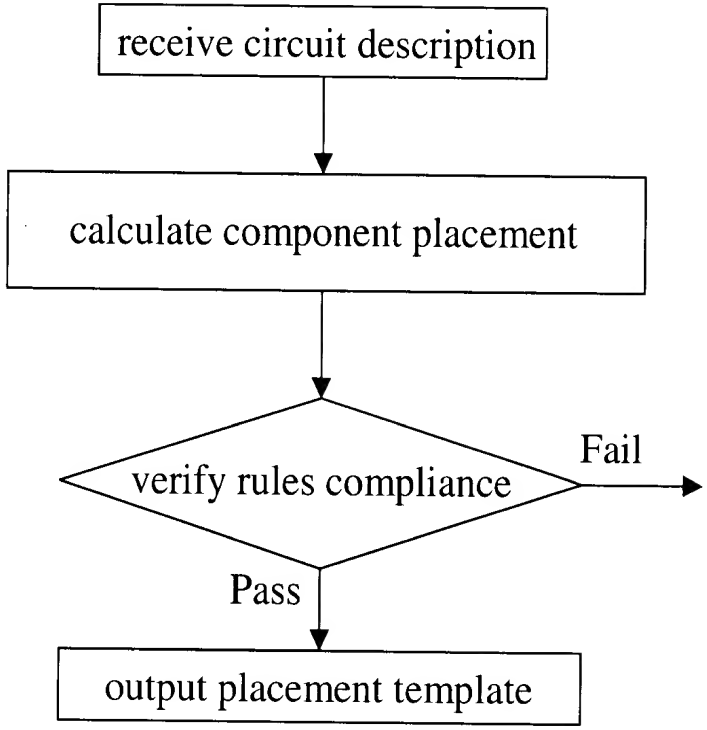


FIG. 70 (RELATED ART)

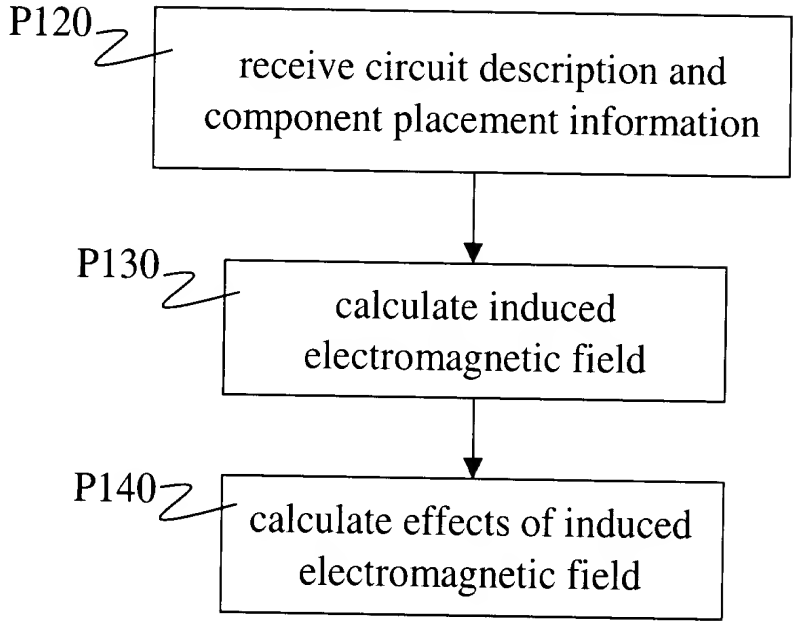


FIG. 71

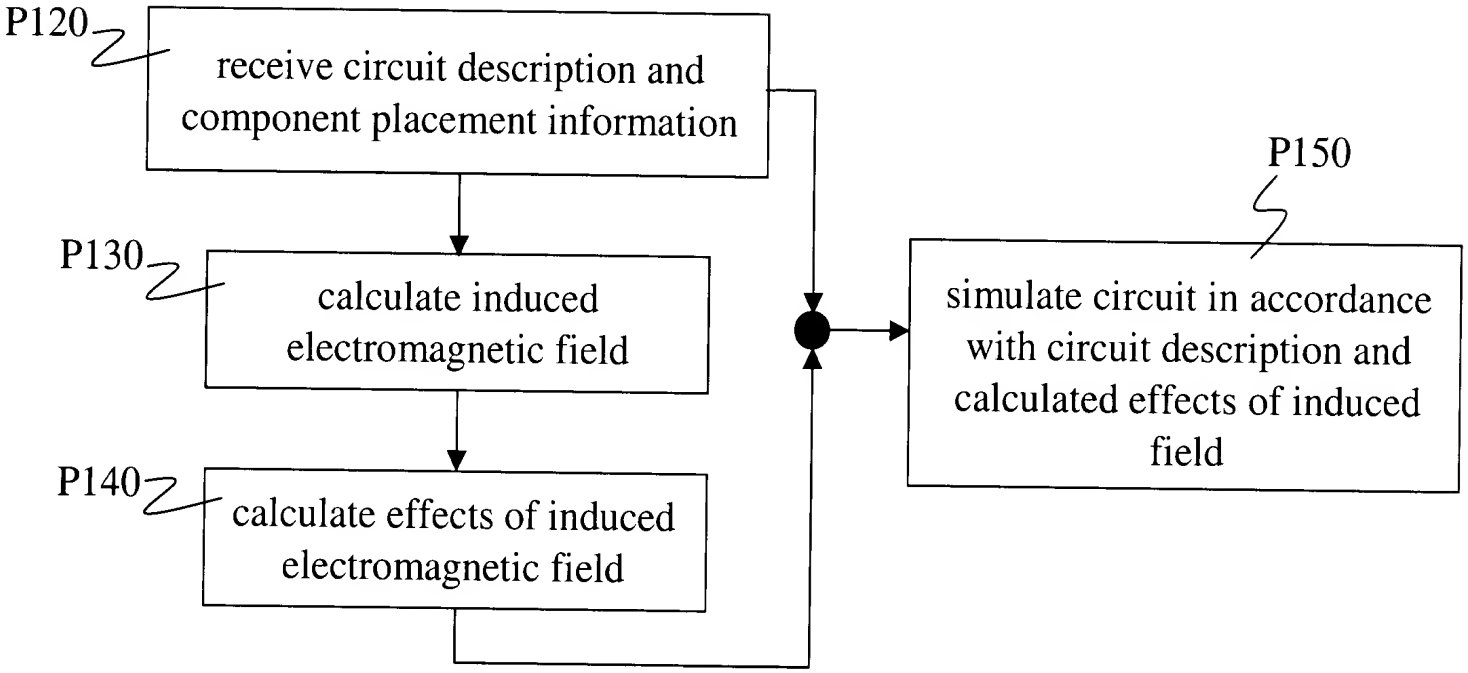


FIG. 72

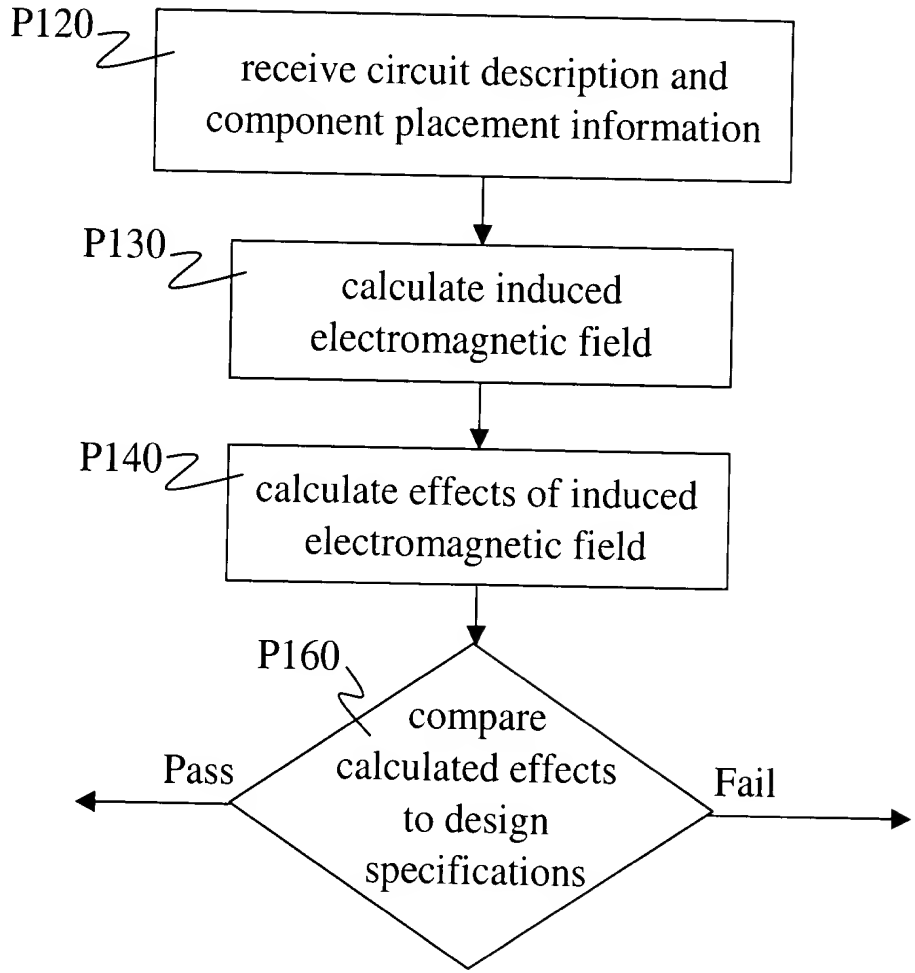


FIG. 73

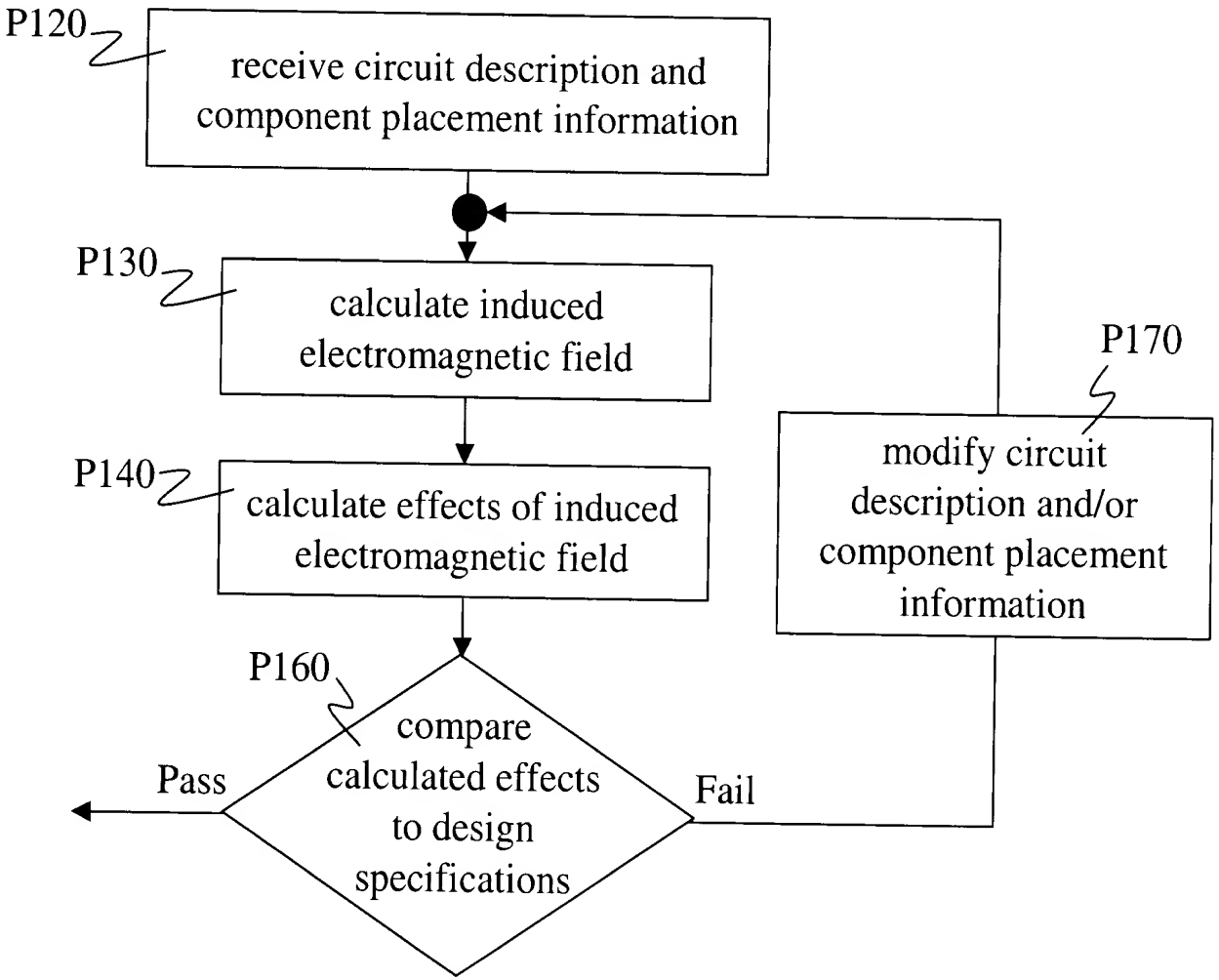


FIG. 74

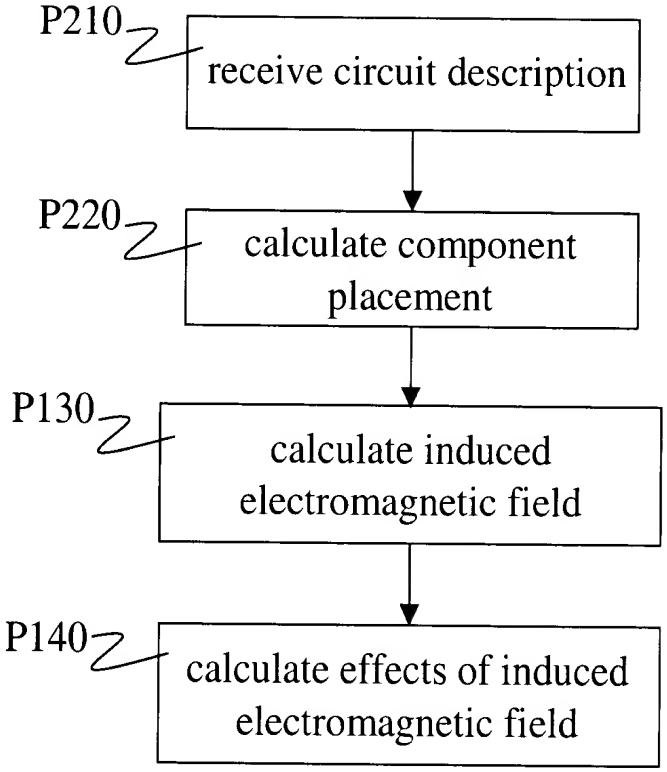


FIG. 75

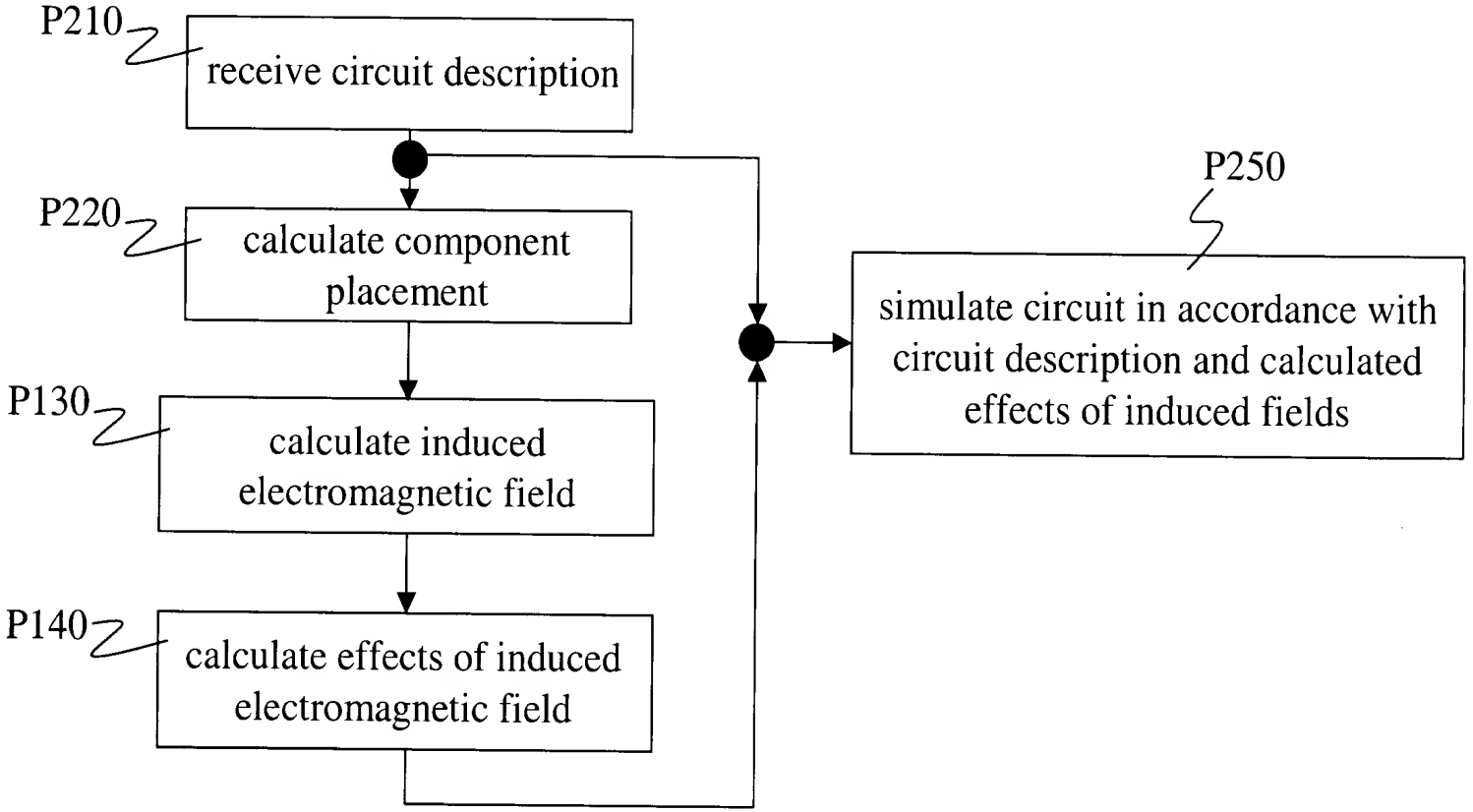


FIG. 76

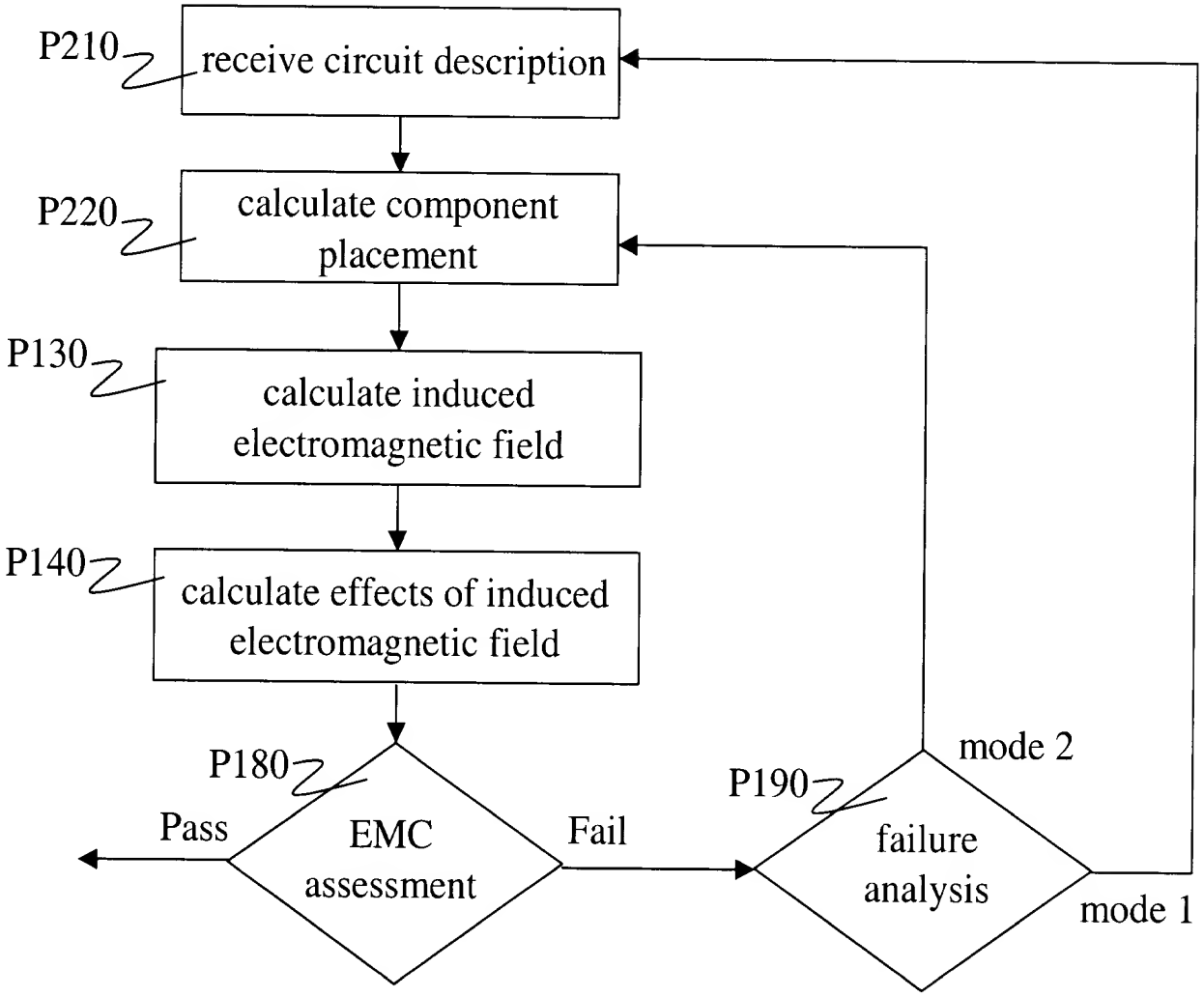

P210
receive circuit description
P220
calculate component placement
P130
calculate induced electromagnetic field
P140
calculate effects of induced electromagnetic field
P180
EMC assessment
Pass
Fail
P190
failure analysis
mode 2
mode 1

FIG. 77

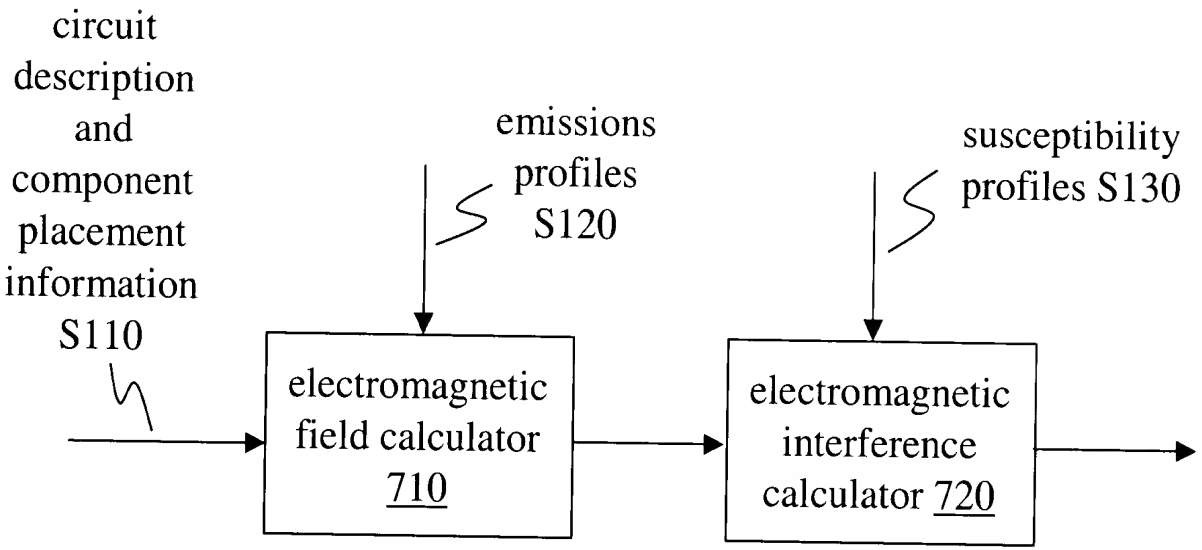


FIG. 78

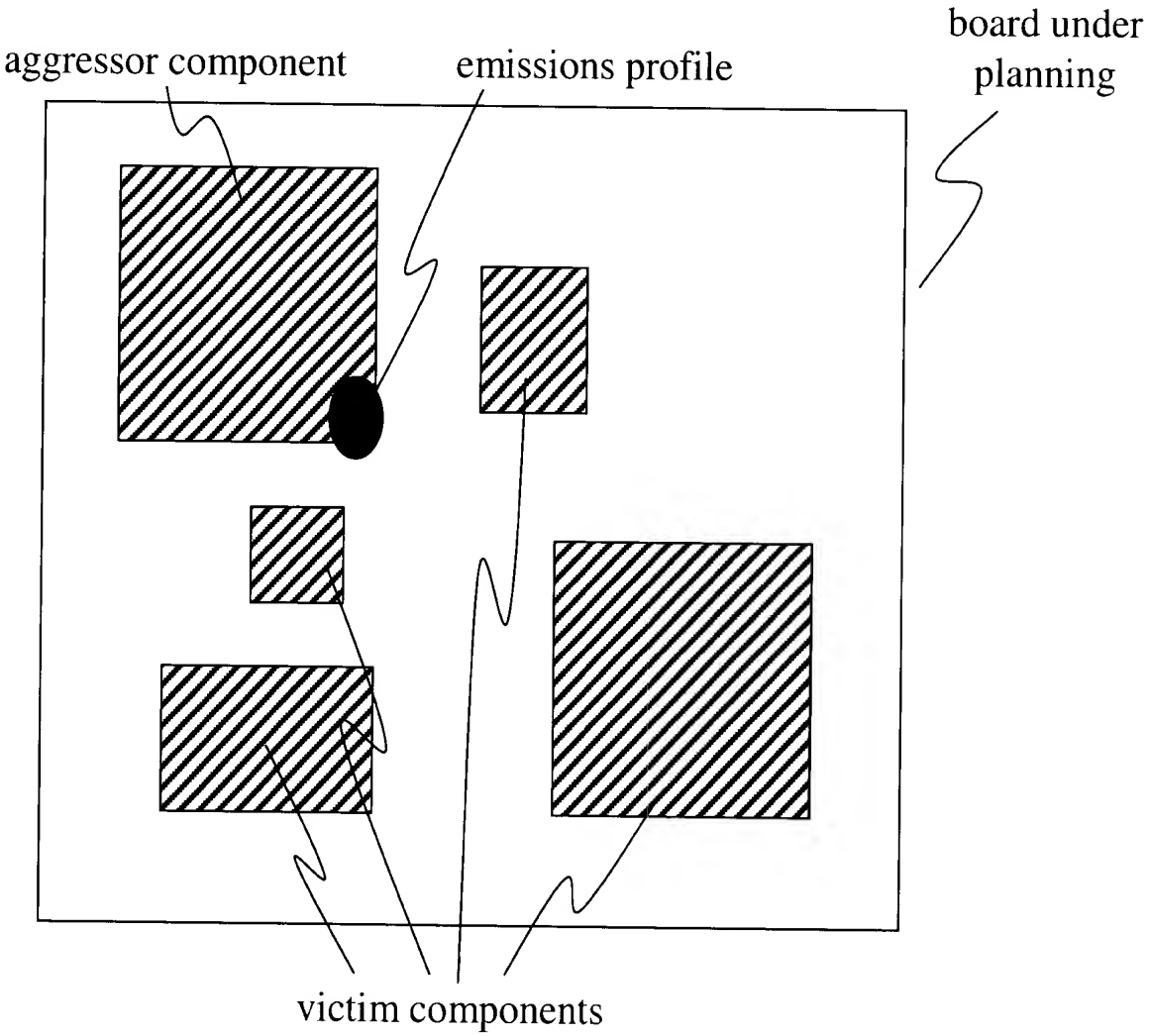


FIG. 79

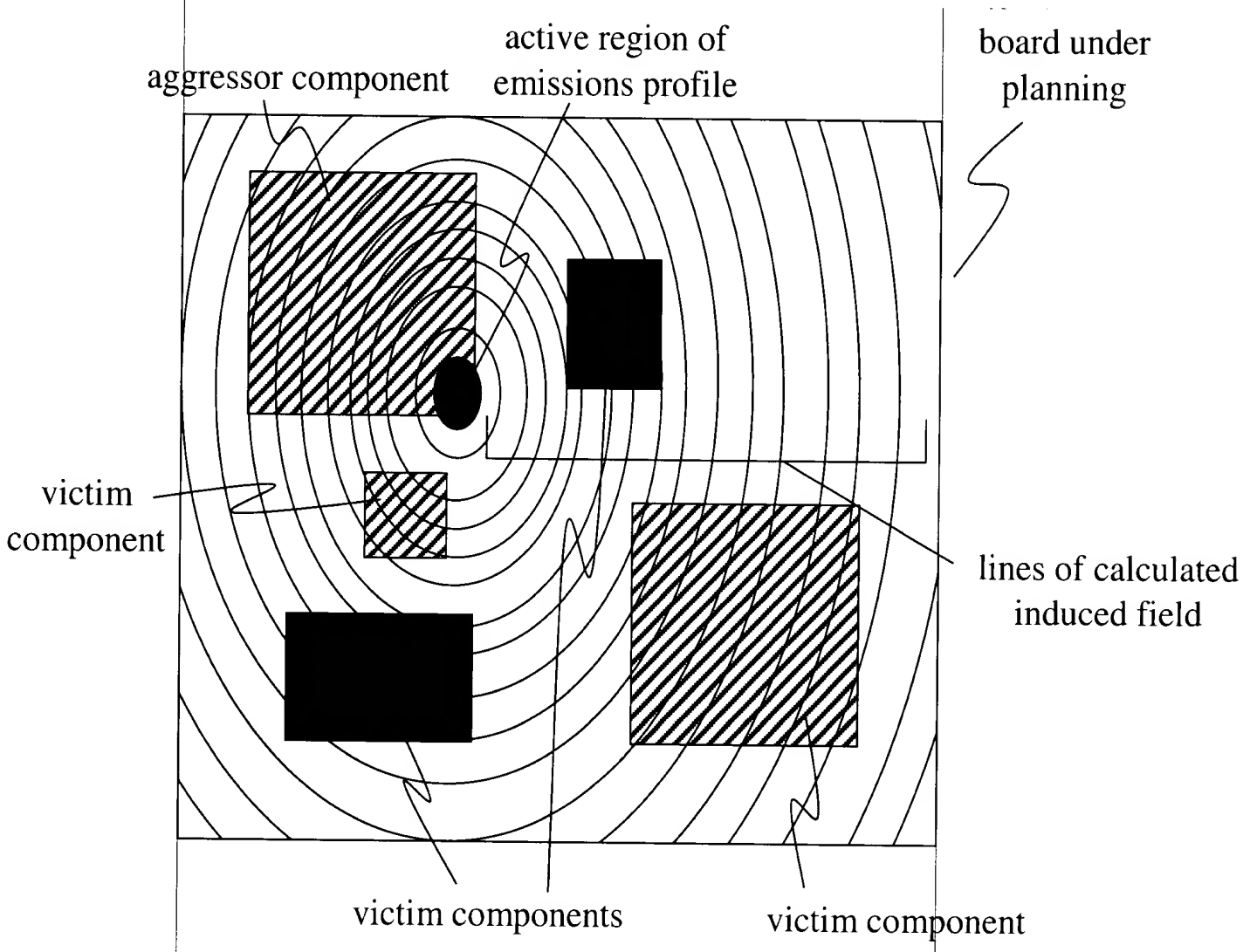


FIG. 80

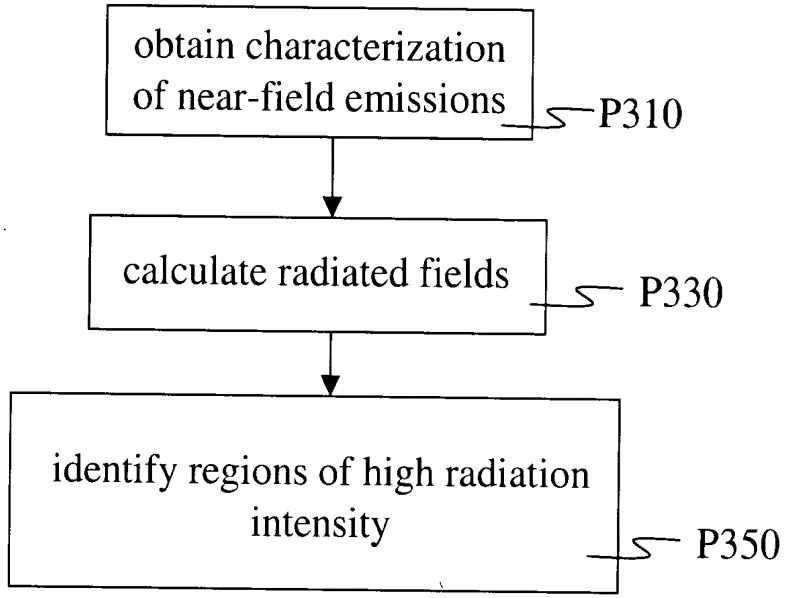


FIG. 81

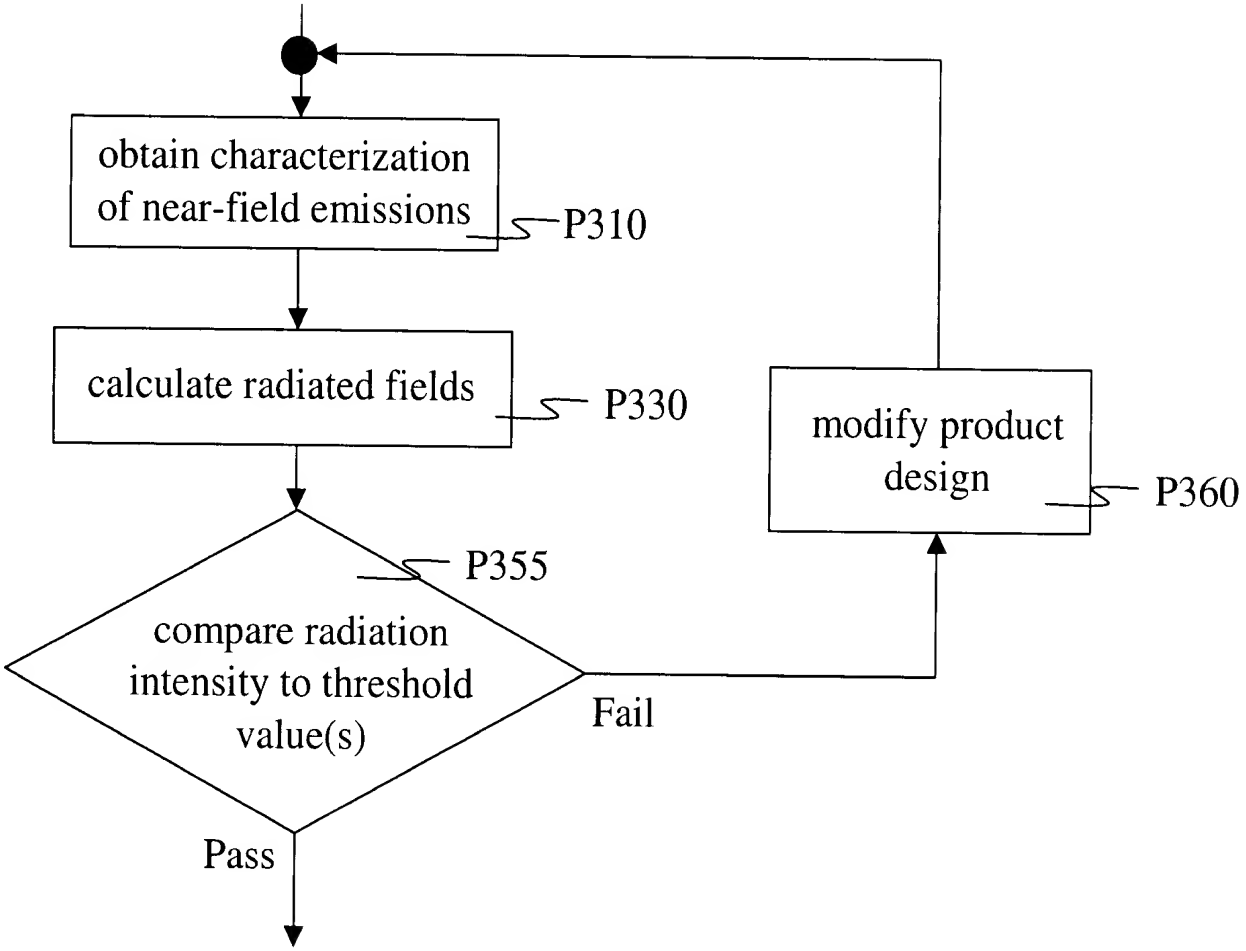


FIG. 82

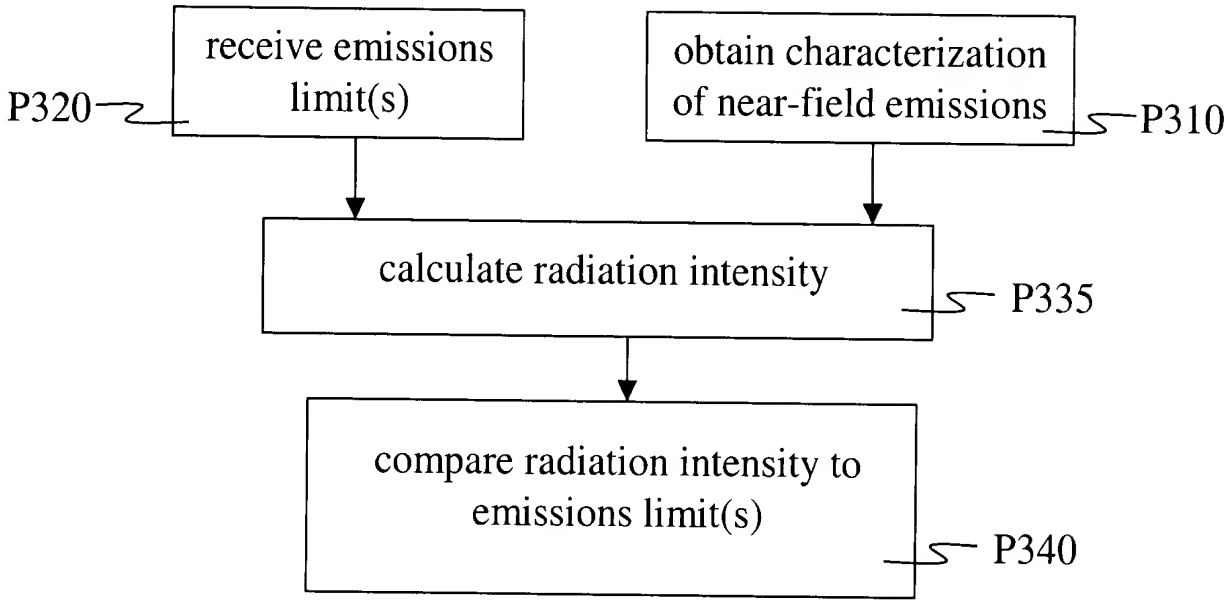


FIG. 83

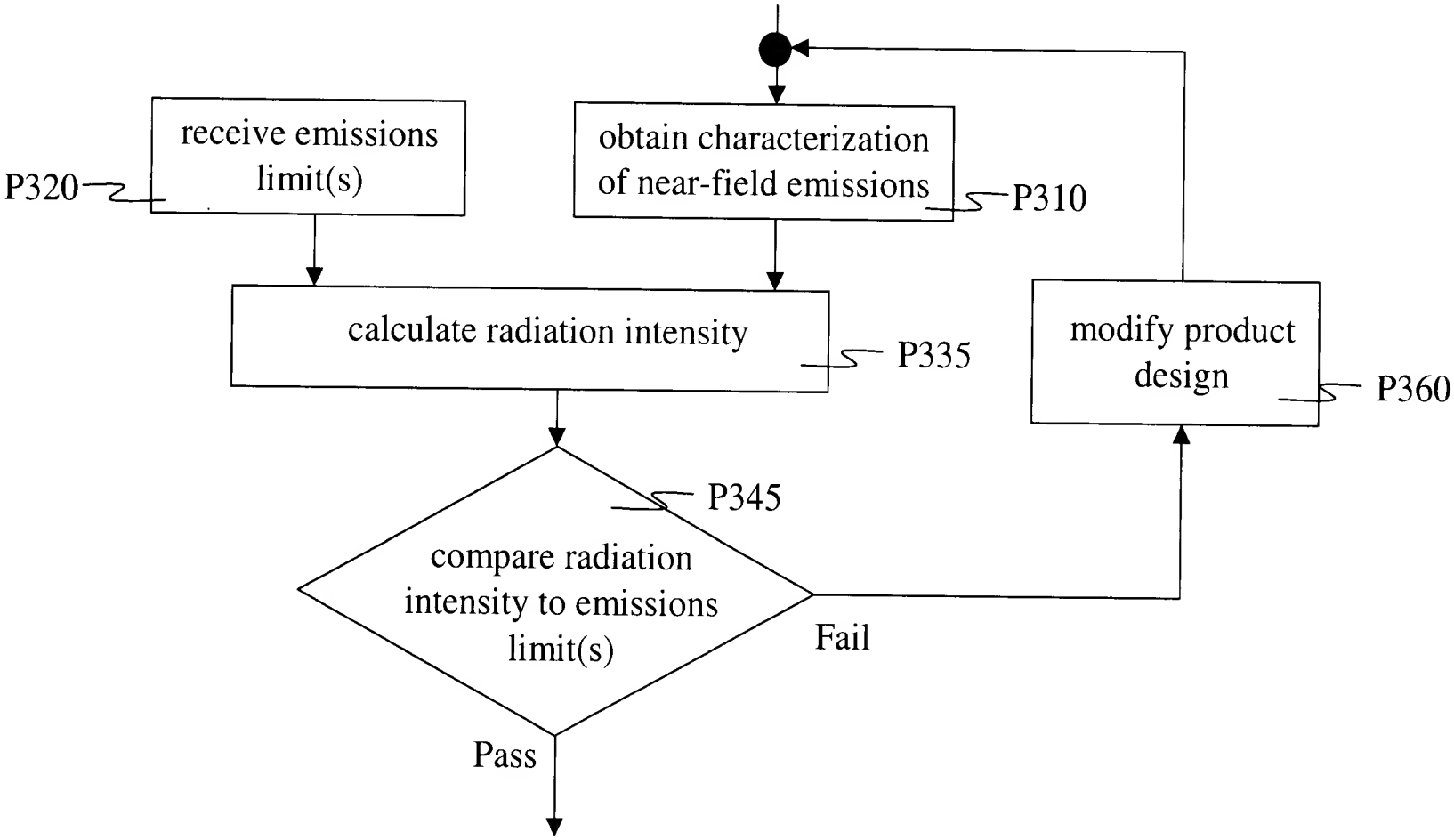


FIG. 84

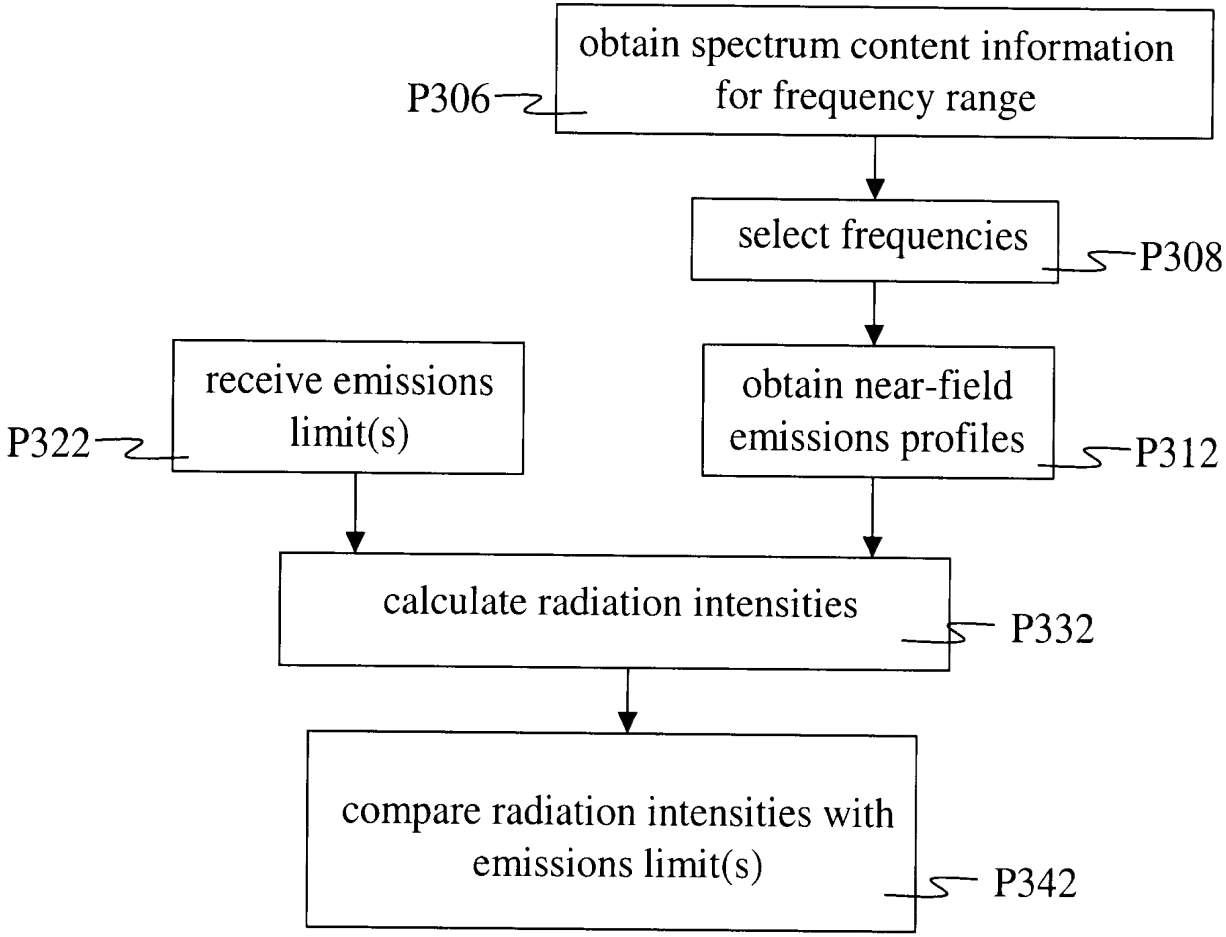
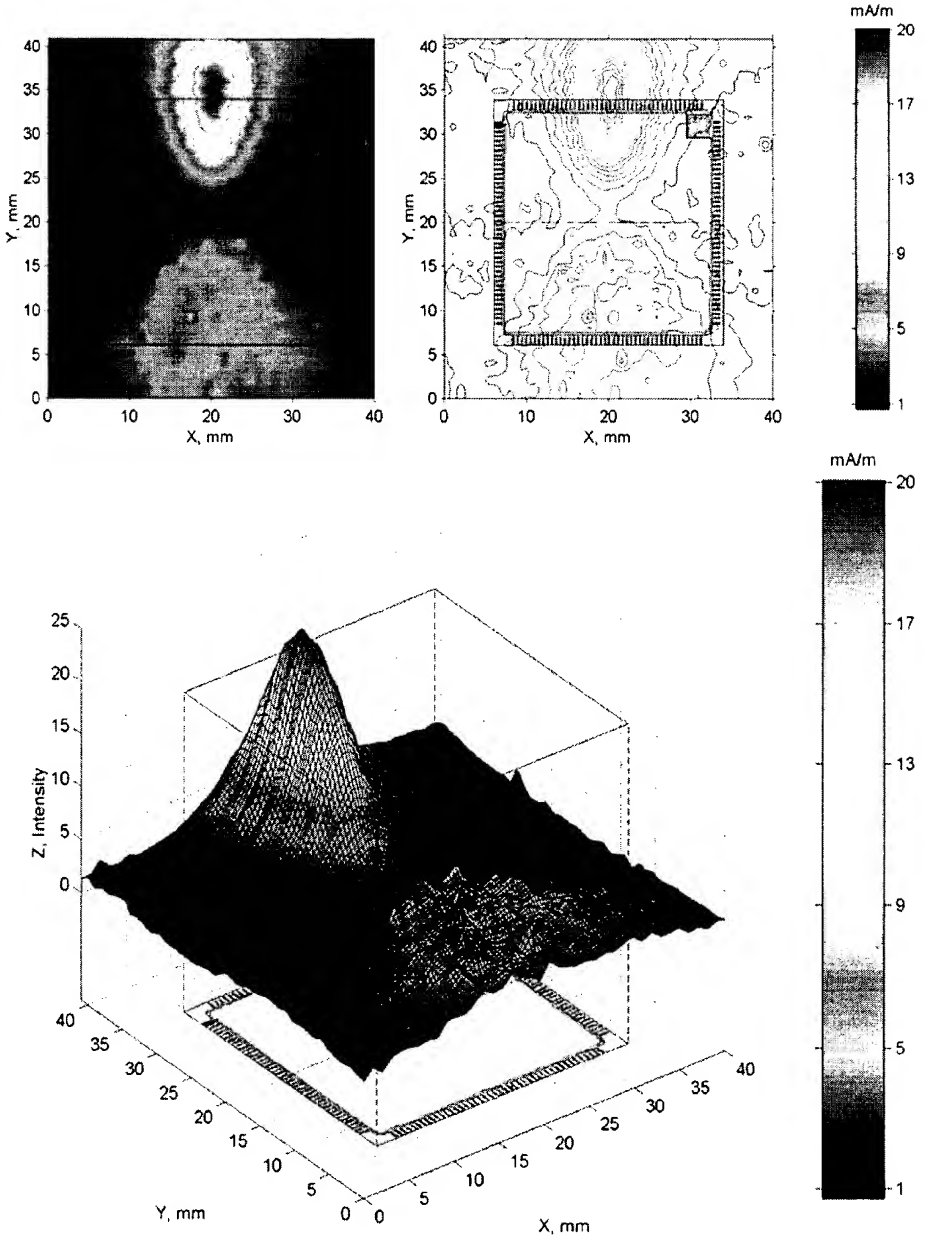


FIG. 85


mA/m
20
17
13
9
5
1
Y, mm
X, mm
Z, Intensity

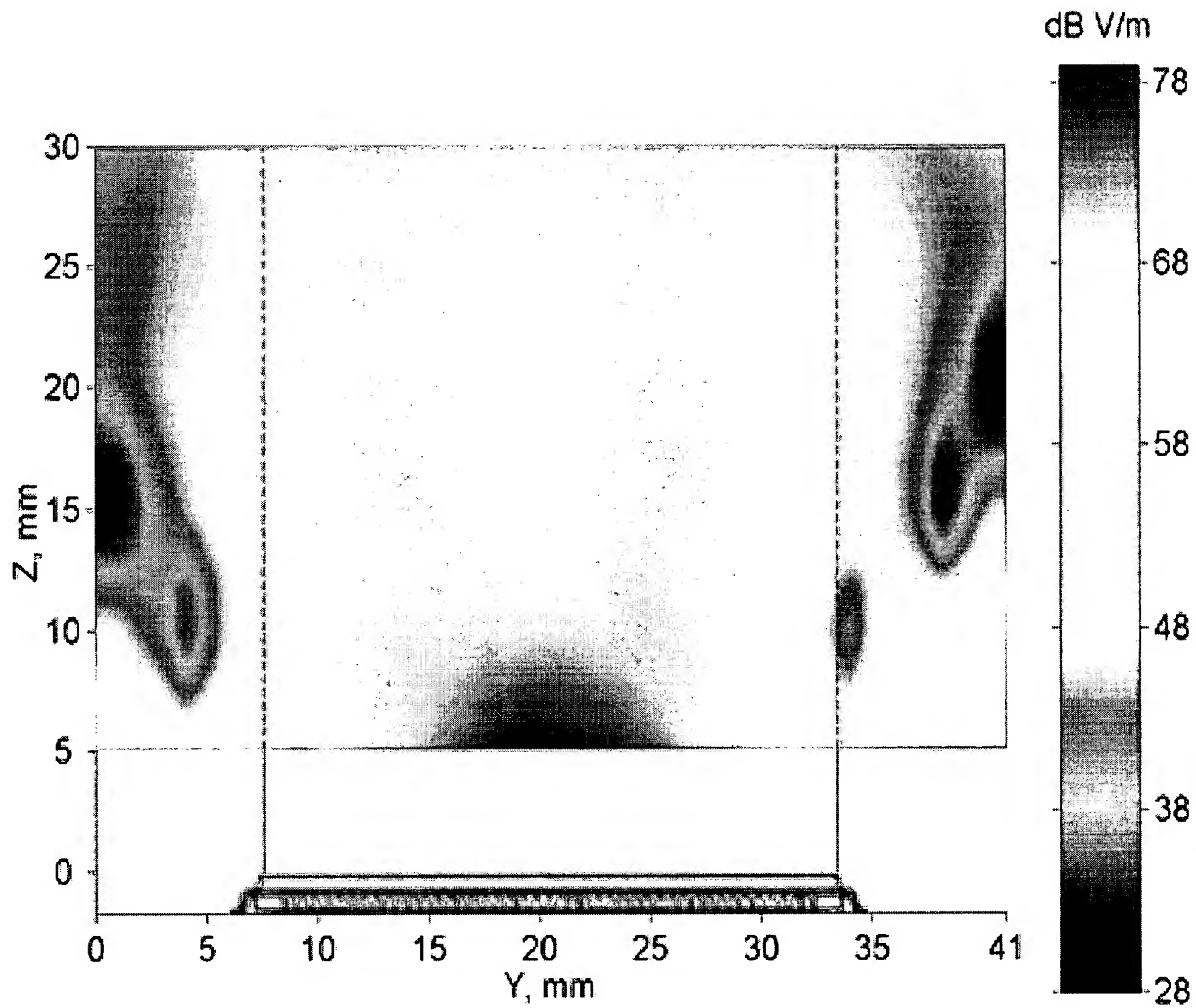


FIG. 87

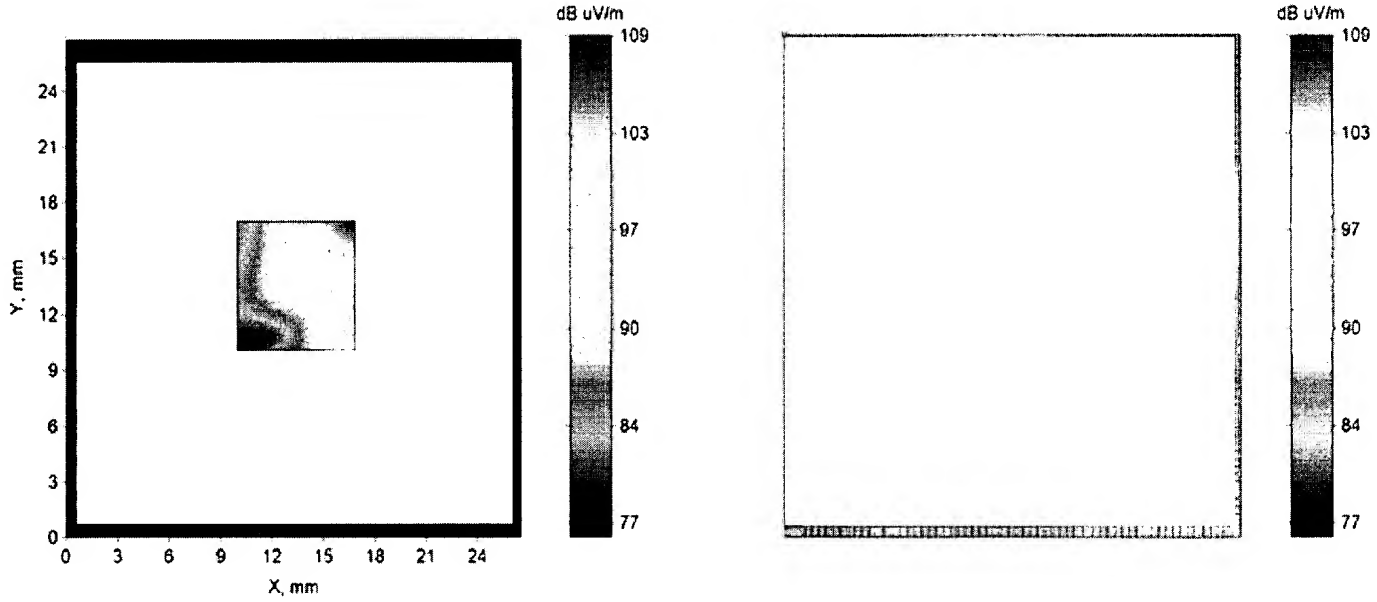


FIG. 88

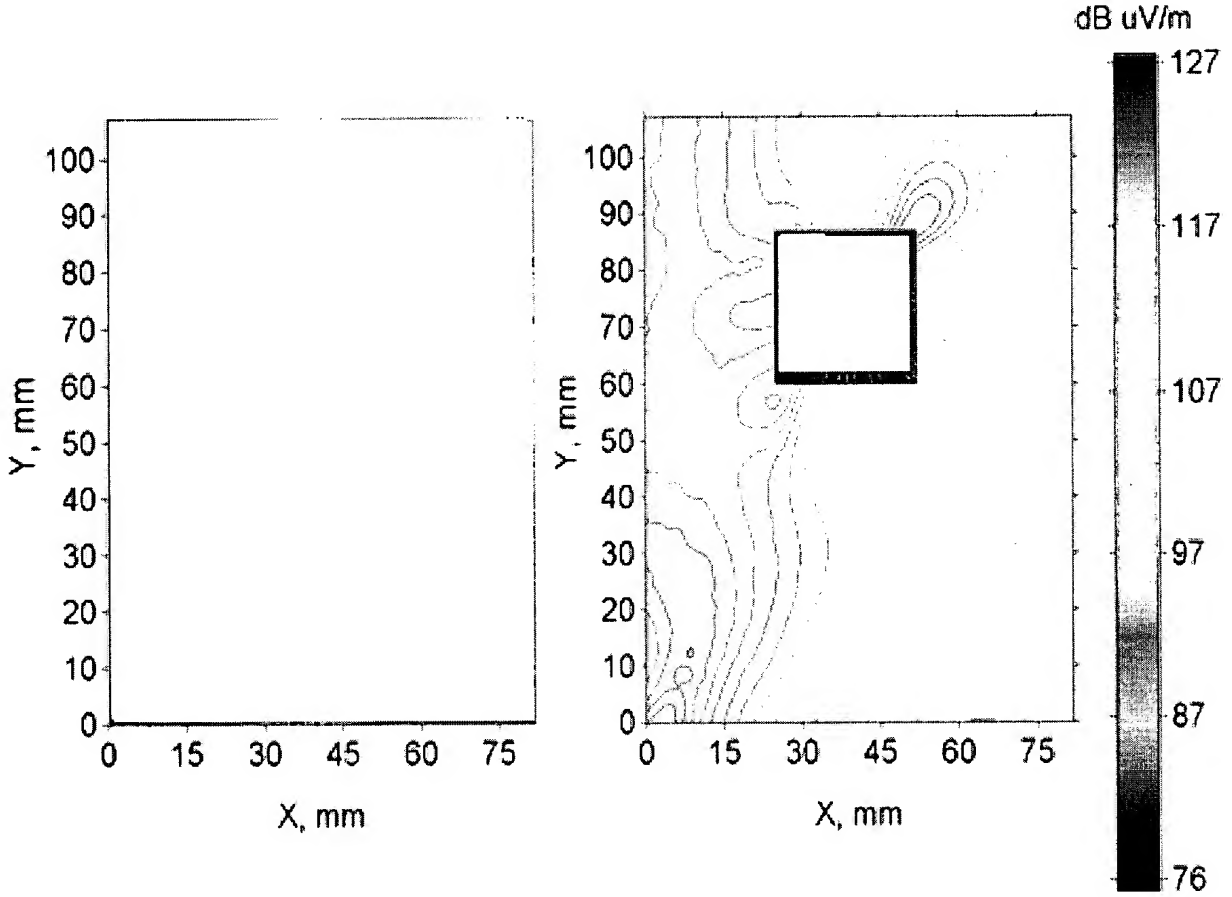
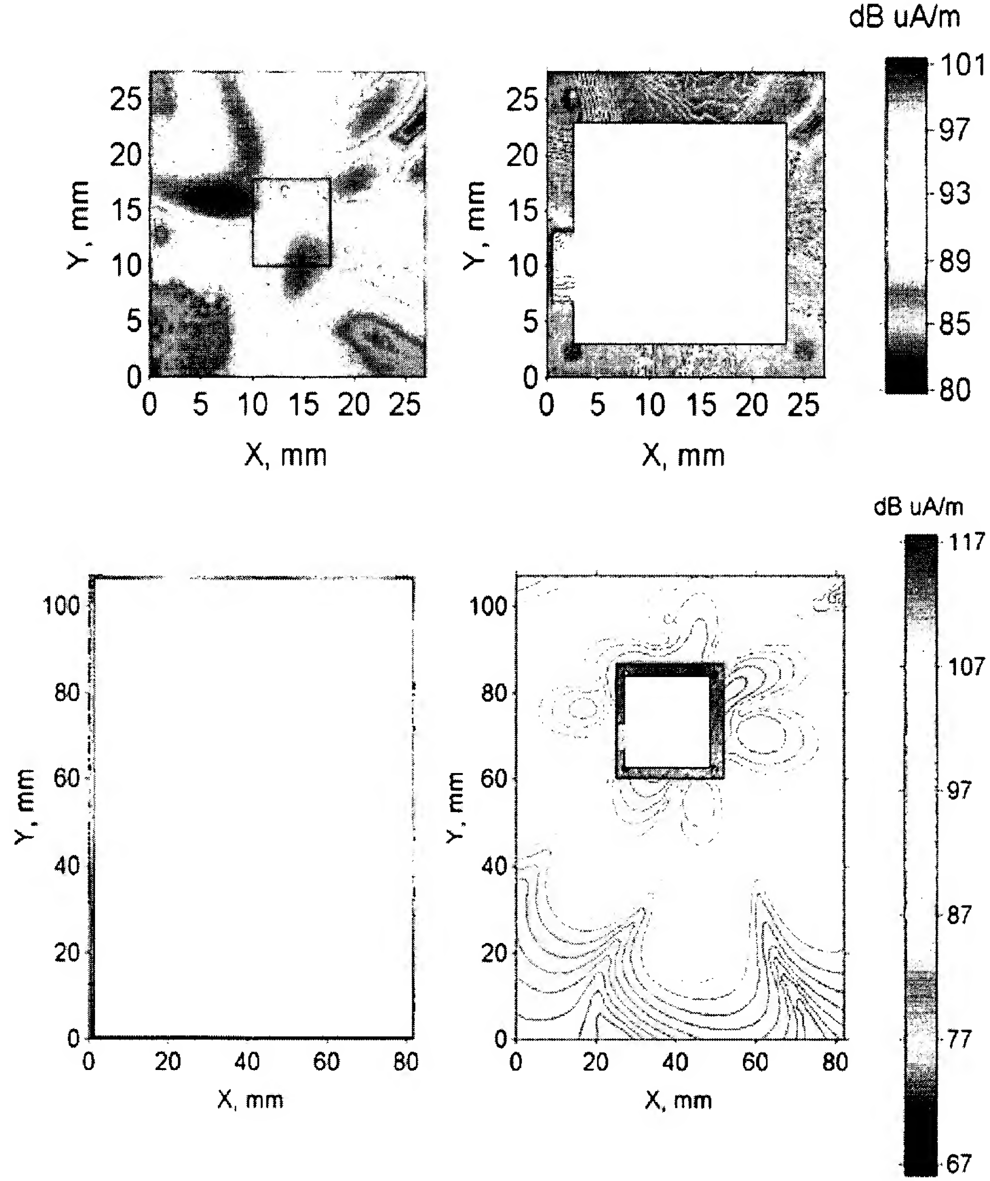

dB uV/m
127
117
107
97
87
76
Y, mm
X, mm
0
15
30
45
60
75
10
20
40
50
70
80
90
100

FIG. 89

FIG. 90


dB uA/m
101
97
93
89
85
80
Y, mm
X, mm
0
5
10
15
20
25
dB uA/m
117
107
97
87
77
67
0
20
40
60
80
100

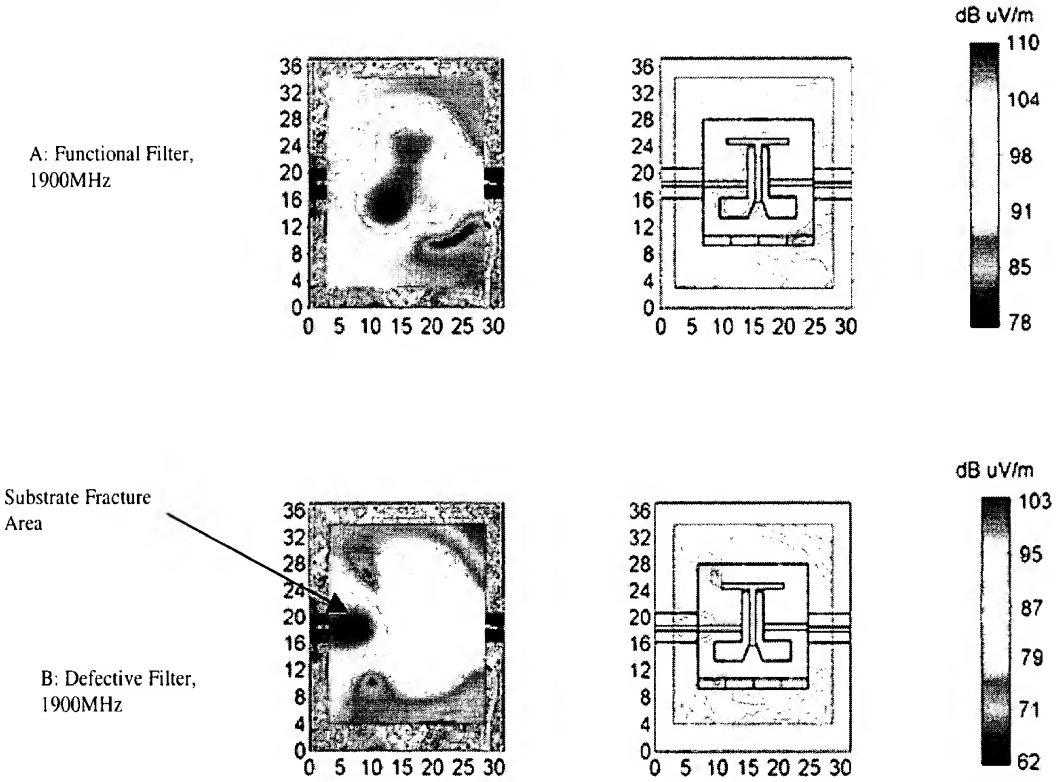
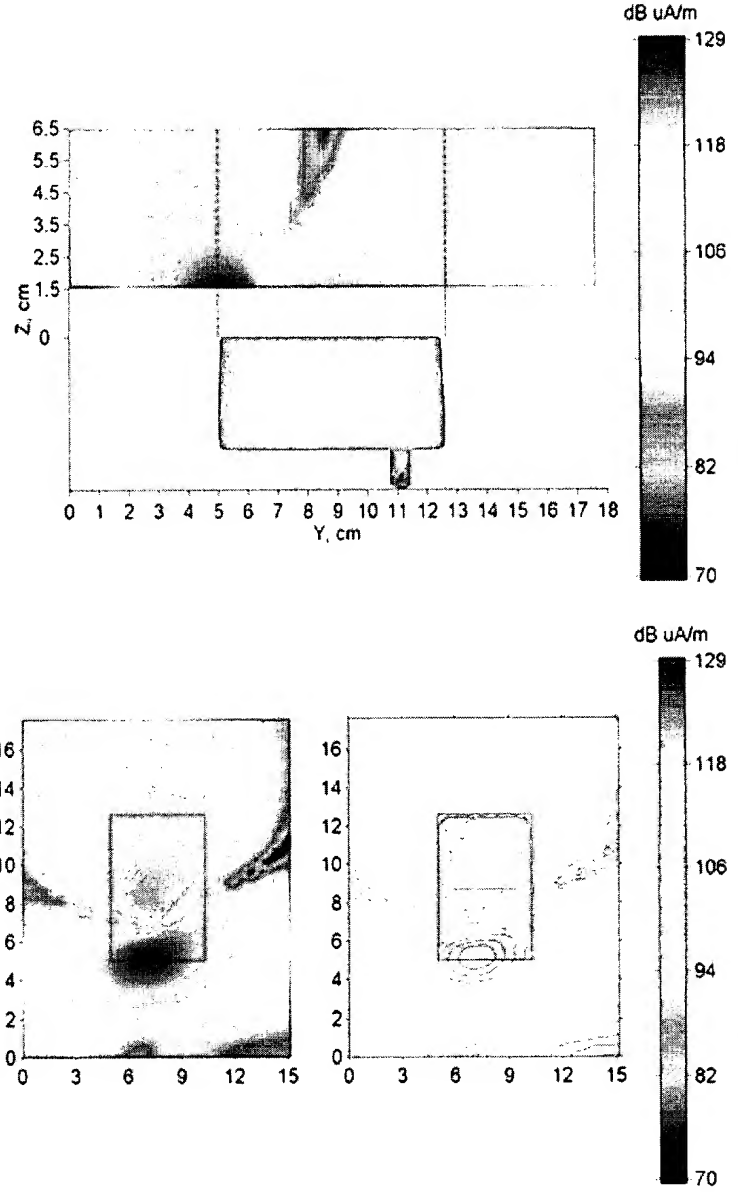

A: Functional Filter, 1900MHz
Substrate Fracture Area
B: Defective Filter, 1900MHz
dB uV/m
110
104
98
91
85
78
dB uV/m
103
95
87
79
71
62
0 5 10 15 20 25 30
0 4 8 12 16 20 24 28 32 36

FIG. 91

FIG. 92



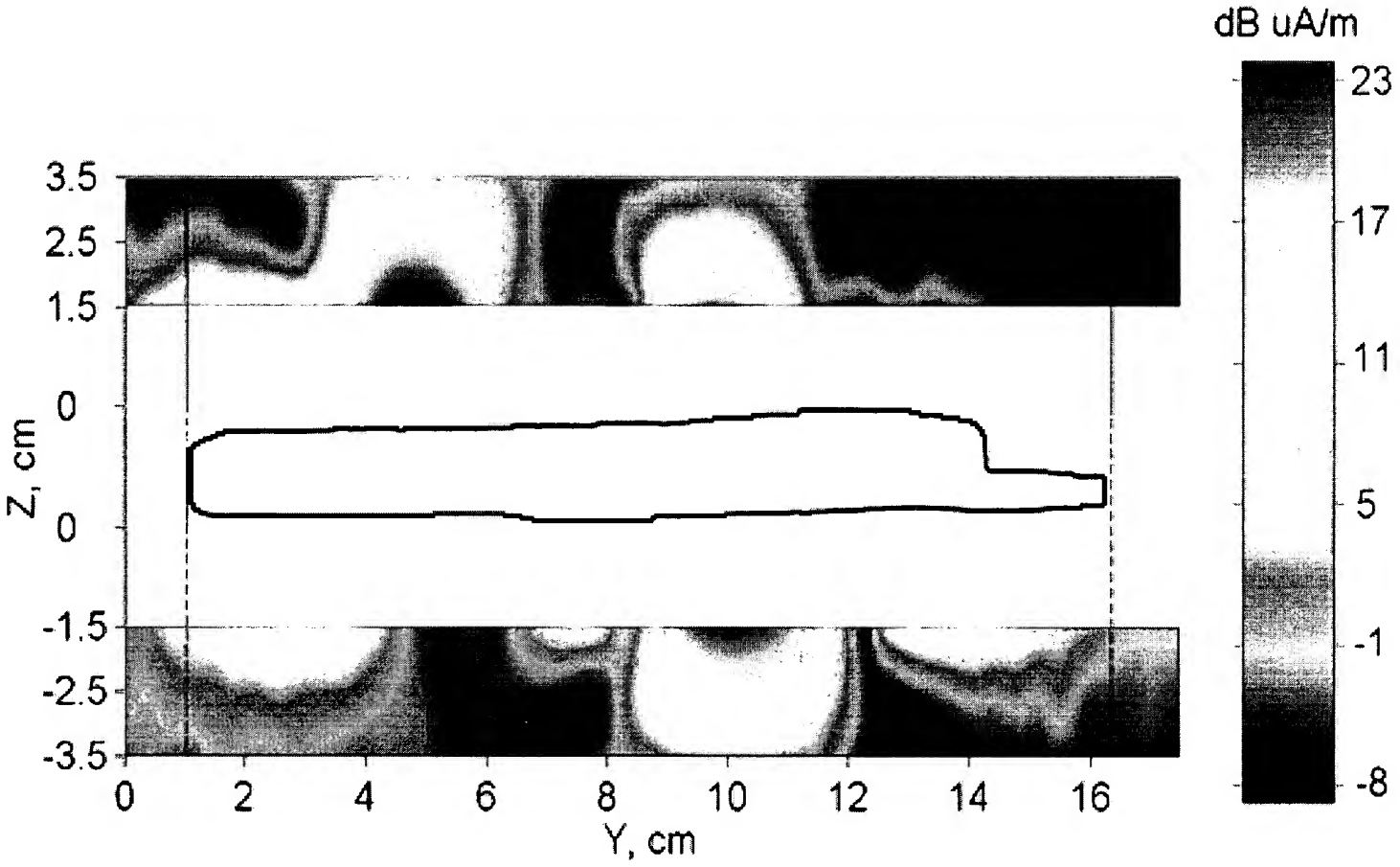
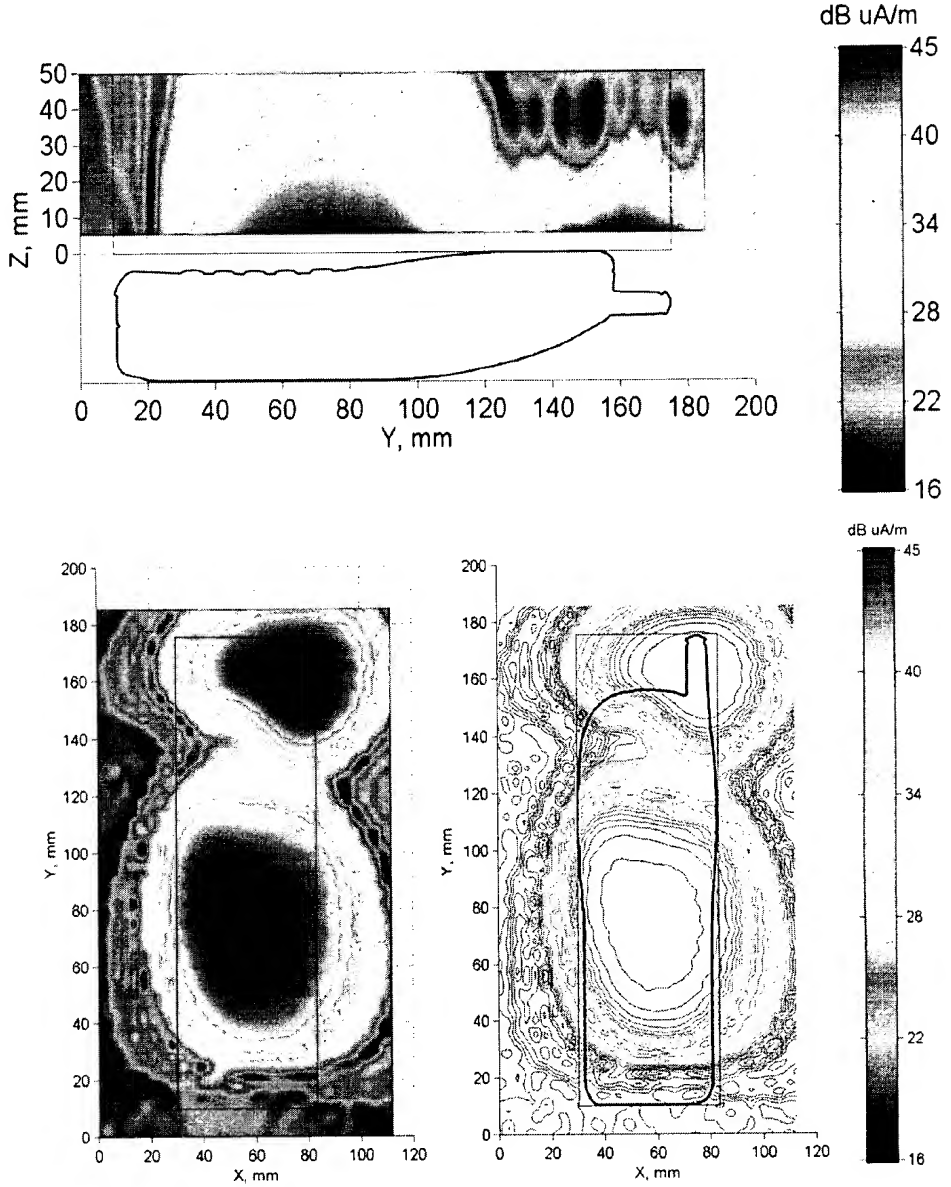


FIG. 93

FIG. 94



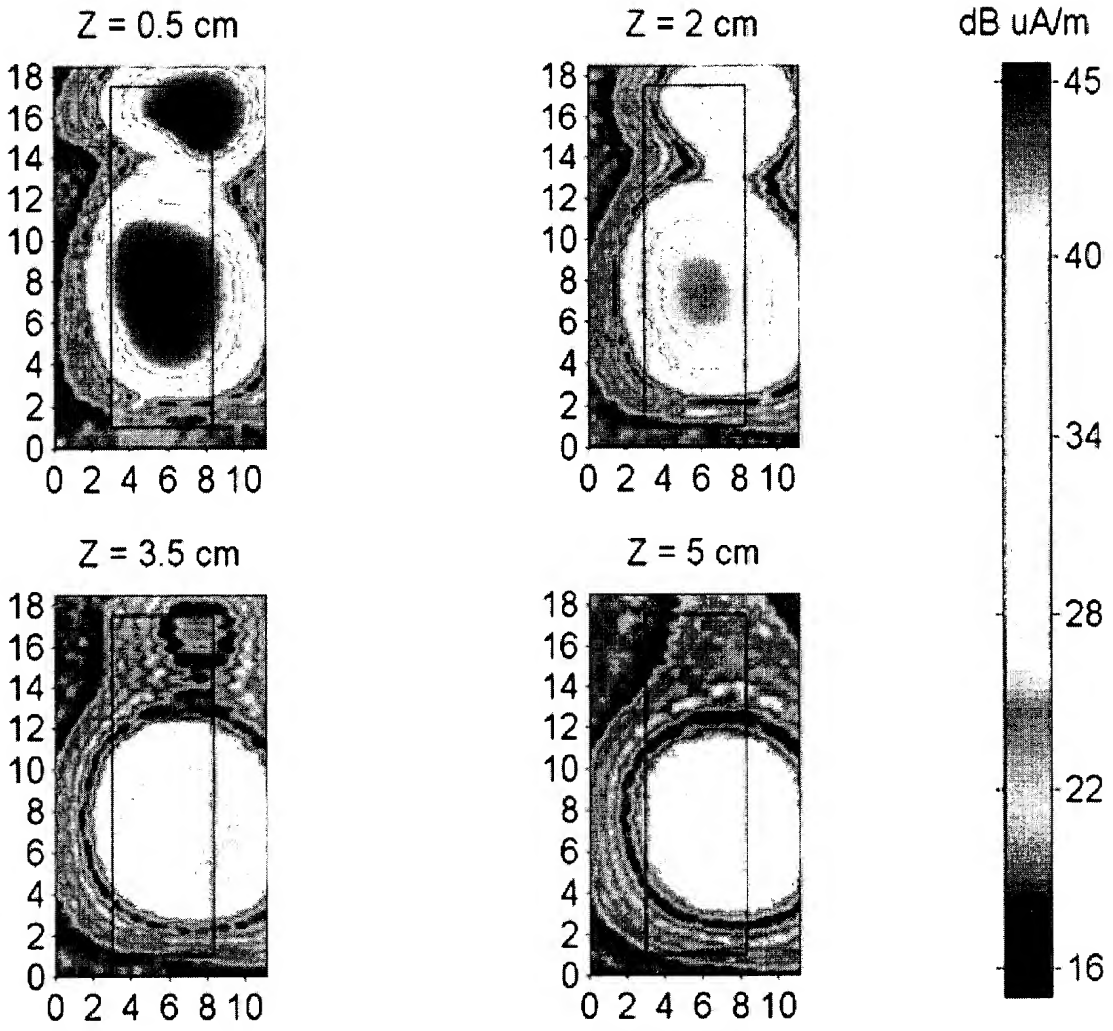

Z = 0.5 cm
Z = 2 cm
dB uA/m
Z = 3.5 cm
Z = 5 cm
18
16
14
12
10
8
6
4
2
0
0 2 4 6 8 10
45
40
34
28
22
16

FIG. 95

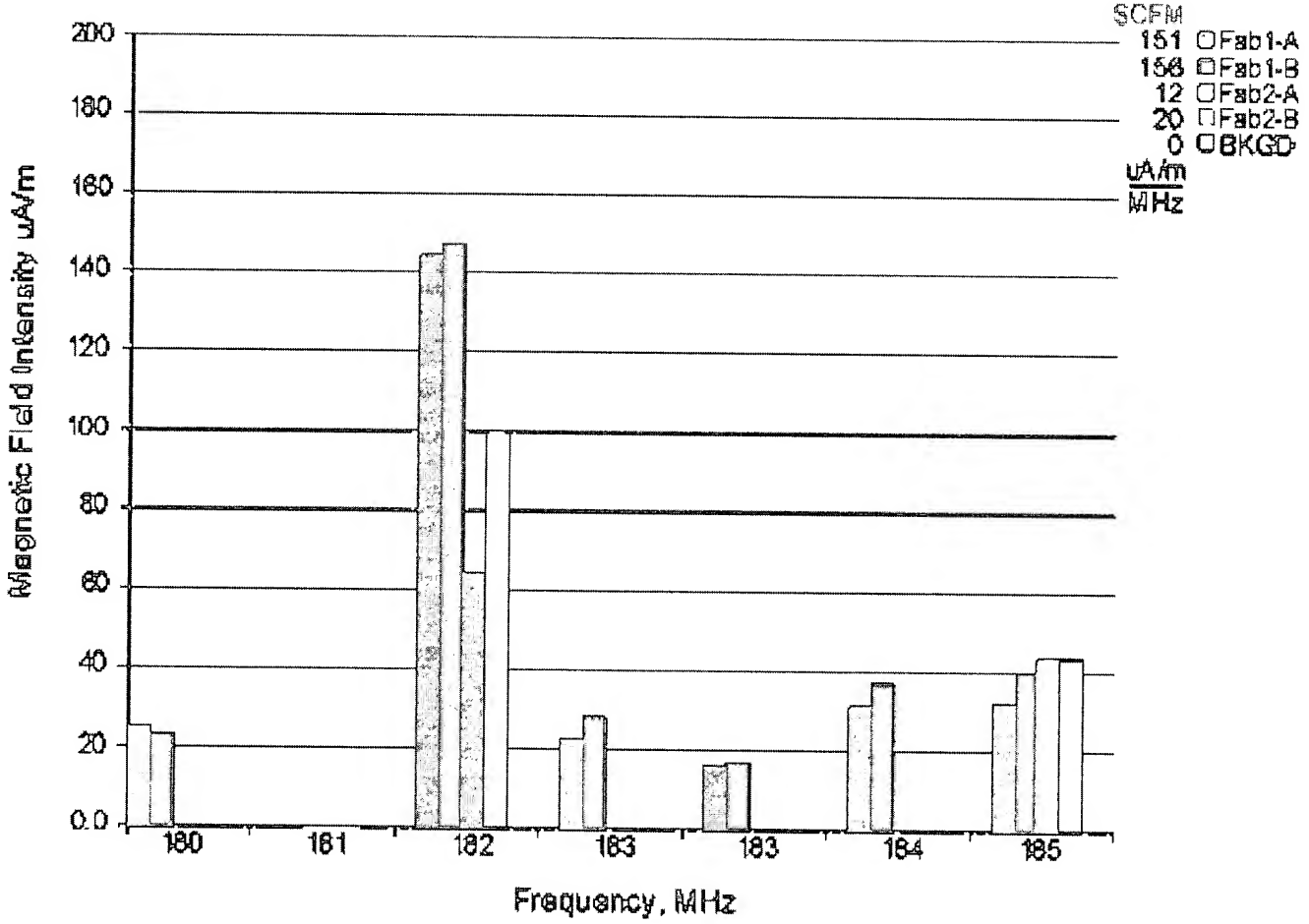

SCFM
151 Fab1-A
156 Fab1-B
12 Fab2-A
20 Fab2-B
0 BKGD
uA/m
MHz
Magnetic Field Intensity uA/m
200
180
160
140
120
100
80
60
40
20
0.0
180
181
182
183
183
184
185
Frequency, MHz

FIG. 96

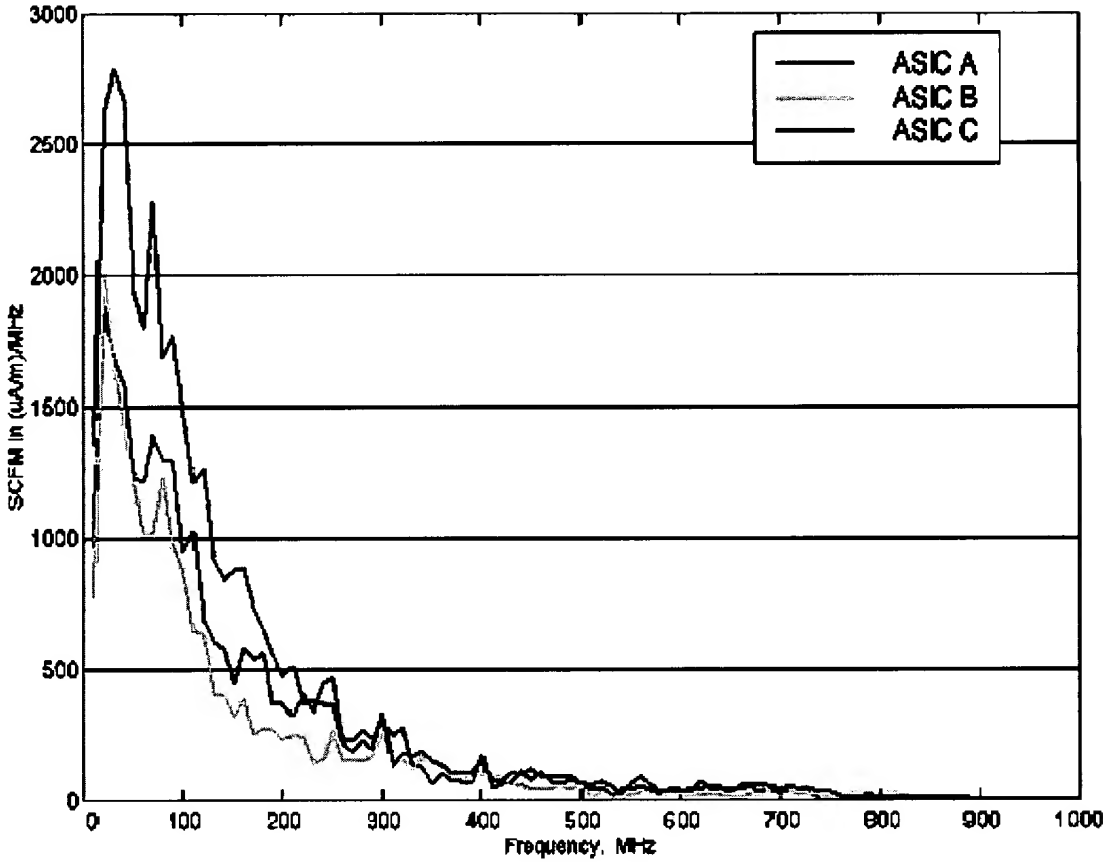


FIG. 97

FIG. 98

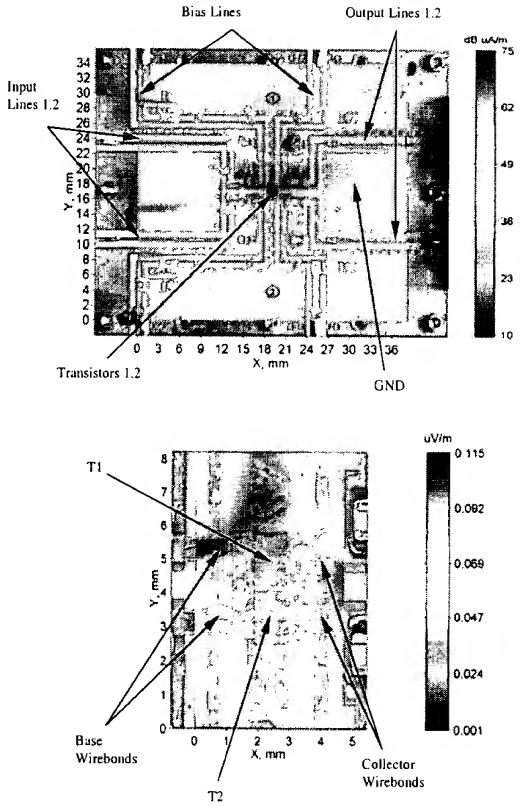

Bias Lines
Output Lines 1.2
Input Lines 1.2
dB uA/m
75
62
49
36
23
10
Y, mm
X, mm
Transistors 1.2
GND
T1
T2
Base Wirebonds
Collector Wirebonds
uV/m
0.115
0.092
0.069
0.047
0.024
0.001

FIG. 99

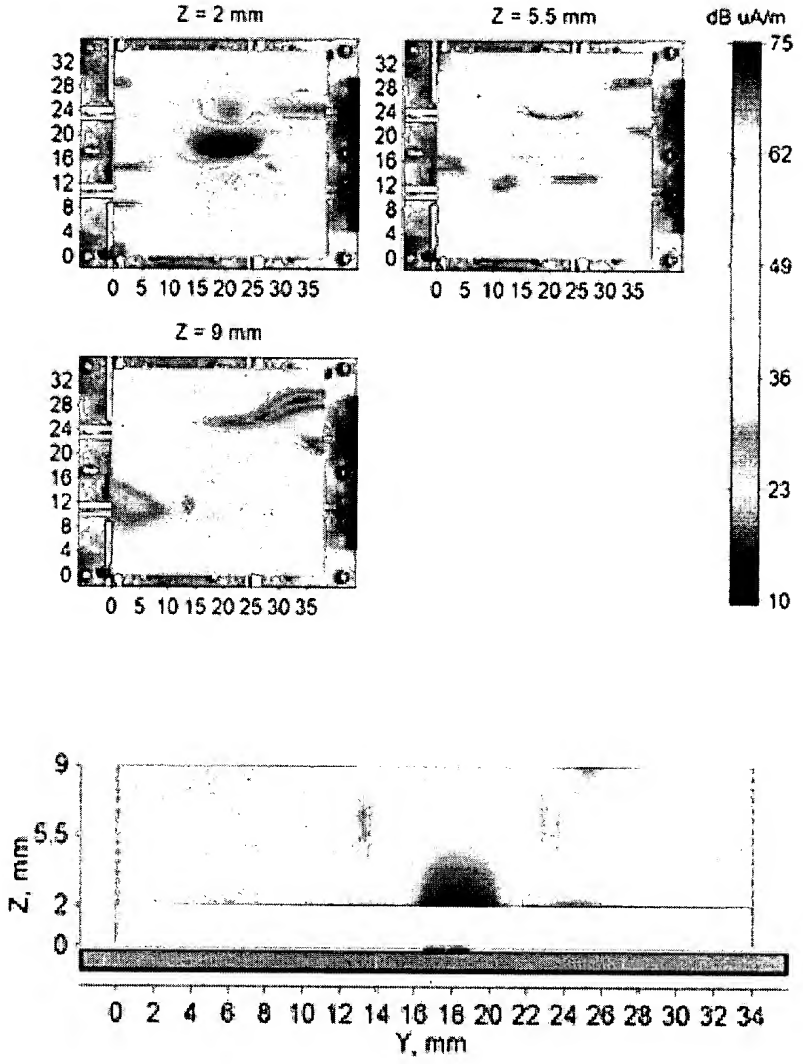
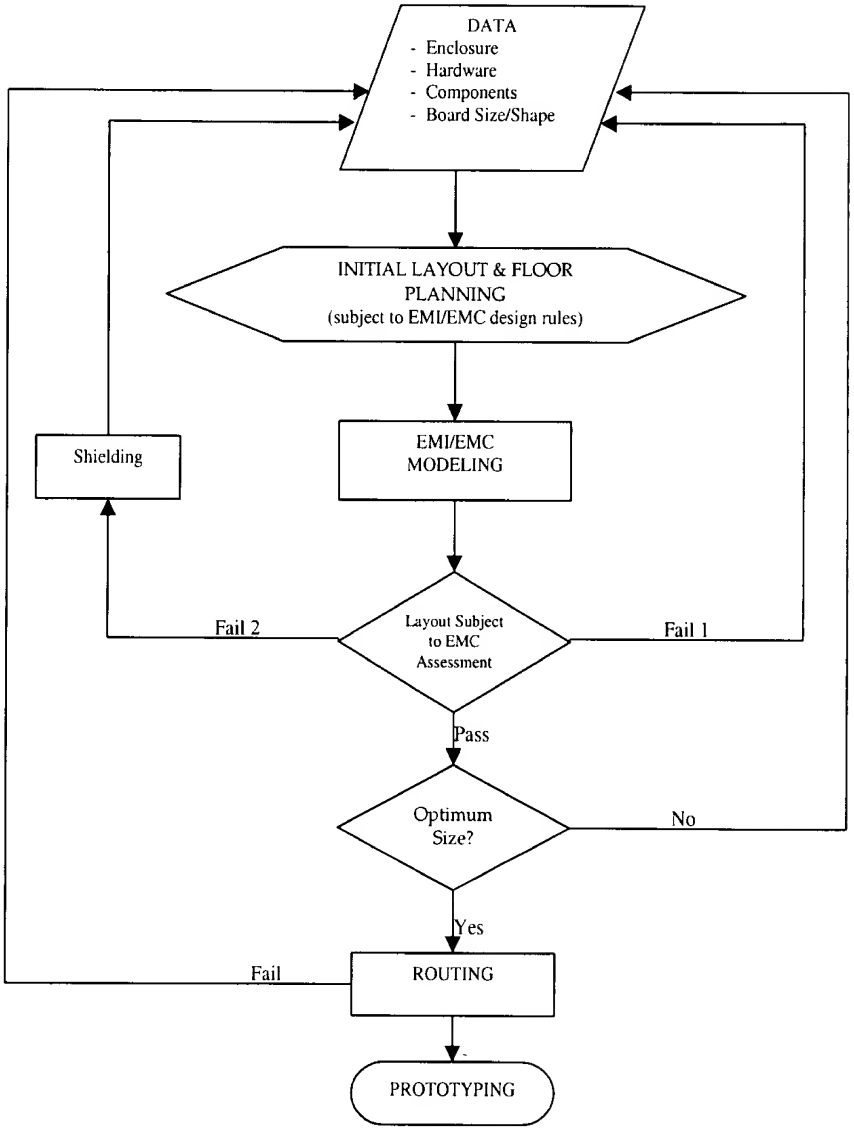


FIG. 100


DATA
- Enclosure
- Hardware
- Components
- Board Size/Shape
INITIAL LAYOUT & FLOOR PLANNING
(subject to EMI/EMC design rules)
EMI/EMC MODELING
Shielding
Layout Subject to EMC Assessment
Fail 2
Fail 1
Pass
Optimum Size?
No
Yes
ROUTING
Fail
PROTOTYPING